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ABSTRACT

The accountability movement has forced educators to expend energys during the past few years ensuring that students master a developmental sequence of skills in the major content areas. In mathematics this has resulted in an emphasis upon computational proficiency, and, in the view of many mathematics educators, not enough time has been spent on problem-solving skills. This material was designed to be a systematic approach to curriculum enrichment so that much of the work can be handled by someone other than a classroom teacher, freeing the teacher to work with students on problem solving, creative thinking, and critical thinking. Superstars II is offered as an opportunity for self-motivated students who choose to become involved in the program. The program is managed by an adult (volunteer, aide, etc.) and focuses on the acquisition of the "skills for excellence" identified for Florida schools. This document includes: (1) a description of the Superstars program; (2) student worksheets for grades four and five; and (3) teacher commentary for the student worksheets, including the skills of excellence for fifth grade. (TW)

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SUPERSTARS II,

Intermediate

A STANDARDS OF EXCELLENCE CURRICULUM PROJECT FOR INTERMEDIATE-LEVEL STUDENTS

BEST COPY AVAILABLE

ACKNOWLEDGEMENTS

This project was conceived of, coordinated by, and supported financially through the Florida Department of Education (DOE). Student materials were developed, field tested, and reviewed by a large number of Florida's district teachers, principals, supervisors and DOE consultants.

Many of the problems in SUPERSTARS II are adaptations of problems from the National Council of Teachers of Mathematics (NCTM) publications, Long Island Mathematical Olympiads for Elementary Schools (LIMOS), and Brevard County's Project Magic. We gratefully acknowledge these contributions.

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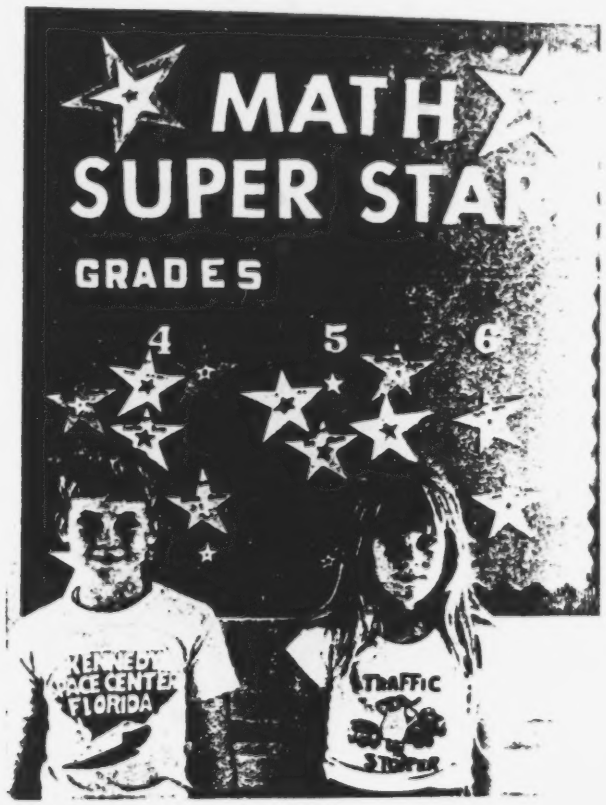


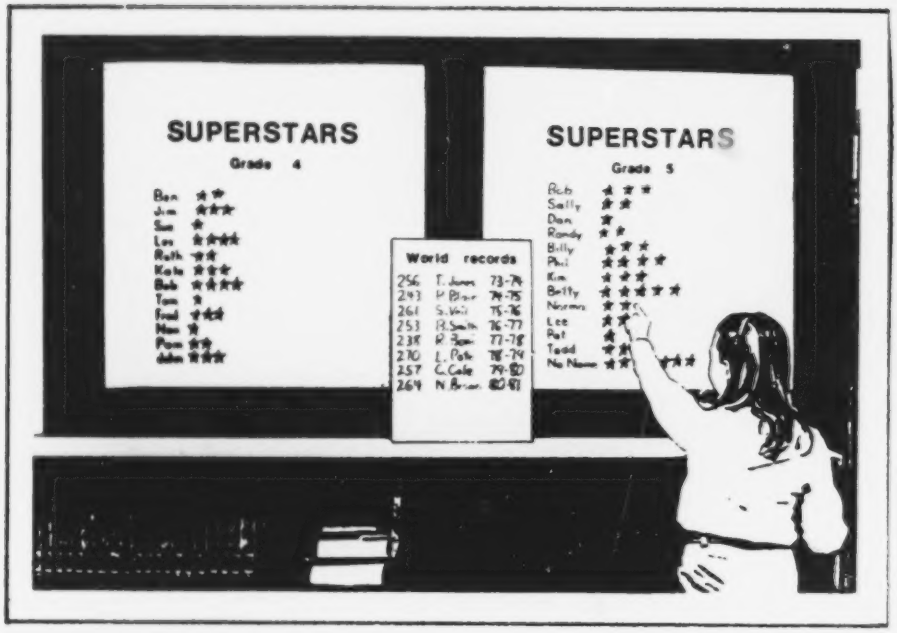
PREFACE

Providing appropriate educational experiences for the entire spectrum of students found in most elementary classrooms is a very real problem. Accountability has forced educators to expend most of their energies during the past few years ensuring that students master a developmental sequence of skills in the major content areas. Society has generally interpreted such sequences in elementary mathematics as leading primarily to computational proficiency. One consequence of this emphasis is that not as much time is available for activities that develop basic problem-solving skills that go beyond the minimal, nor for enrichment experiences that expand a student's creative tendencies.

In 1984, Florida's State Board of Education adopted "Standards of Excellence" as benchmark indicators of what able students in quality programs should strive for in mathematics. These skills are written for students who have completed the 3rd, 5th, 8th, and 12th grades. Those skills that pertain to the elementary grades are listed in the first few pages of the Teacher Commentary section of this package. This material is intended to provide a supplementary program to help students learn and practice these "skills of excellence" over a five- year period.

This material uses a systematic approach to curriculum enrichment that is designed so that much of the work can be handled by someone other than a classroom teacher, freeing the teacher for the part that he or she does best--helping students learn how to think critically and creatively. The system is not meant to replace any aspect of the normal school curriculum--it is offered as a peripheral opportunity to self-motivated students who identify with challenges, who want to do more in school than we ask of them, and who enjoy being rewarded for their extra efforts. Since progress toward "excellence" requires a commitment on the student's part, participation in SUPERSTARS should be optional--only those students who choose to become involved will be successful in the program, over a full academic year. Any student, regardless of prior achievement in mathematics, should be allowed to participate as long as they remain interested in the program.

We believe that our schools will respond to this program by recruiting several dedicated adults who can spend the few hours each week making the system operate effectively in a school. We believe that Florida's teachers will welcome this supplementary program intended to enhance their daily efforts to get children to use higher-level thought processes. And finally, we believe that Florida's elementary students will far surpass our initial expectations in demonstrating "excellence" in elementary mathematics.


SUPERSTARS
Grade 4
SUPERSTARS
Grade 5
World records

ORGANIZATION OF THESE MATERIALS

Section 1 ... Description of the SUPERSTARS II program

1) General information
2) Information/checklist for principals
3) Information/checklist for assisting adults
4) Information for teachers
5) Letter to participating students and their parents

Section 2 ... Student worksheets

1) For grade 4, numbers I through XXVIII
2) For grade 5, numbers I through XXVIII

Section 3 ... Teacher Commentary for student worksheets

1) Skills of Excellence for 5th grade, end-of-year
2) Teacher Commentary for grade 4, worksheets I through XXVIII
3) Teacher Commentary for grade 5, worksheets I through XXVIII

SUPERSTARS II: GENERAL INFORMATION

SUPERSTARS II is a program designed to be managed by an assisting adult (volunteer, aide, etc.) and supported by school administrators and classroom teachers. Each has a key role to play in the success of the program. Instructions for each role are described in the succeeding pages.

Students choose on their own to participate in SUPERSTARS II. A weekly cycle is established early in the school year, and follows this format:

> On Monday of each week, student worksheets are distributed by the assisting adult to those in the program. Students have until Friday to complete the problems, working entirely on their own. On Friday, the classroom teacher hosts a brief problem-solving session for the students in the program, discussing the more difficult problems on the worksheet for that week.
>
> Students get double-credit for those problems they completed correctly prior to the problem-solving session, and regular credit for those they complete over the week-end. On Monday all papers are handed in, checked by the assisting adult, and stars posted as a reward for working individual problems. This completes the cycle for the preceding week, allows for the new worksheets to be passed out, and the cycle begins again.
>
> The use of calculators is permissable.

The visual reinforcement of seeing their names displayed in a prominent place in the school, with a string of stars indicating their success, is the basic reward a student receives for the extra work. Some competition will naturally emerge among the students who accumulate a good many stars, but the system does not rely on this competition for its success. Some students will continue in the program week after week, even though they are earning only a few stars. This is particularly evident when schools enhance the basic reward system by awarding varying prizes for attaining different levels of success.

SUPERSTARS II is not a program for every child--it's only for those who are self-motivated and who are not frustrated by challenging situations. This does not diminish the value of the program, but rather makes us realize that "excellence in elementary mathematics" requires something special on the part of the child. Those children who complete the SUPERSTARS program are in the process of becoming excellent mathematics students.

SUPERSTARS II: INFORMATION FOR PRINCIPALS

SUPERSTARS II is a curriculum enrichment package designed to be managed by volunteer assisting adults, with coordinated teaching by the classroom instructor. The purpose of the program is to help students learn the "skills of excellence" identified for Florida schools, in the subject area of mathematics. The complete set of material comes in two packages, one for grades 1, 2, and 3, and the other for grades 4 and 5. Worksheets from the original SUPERSTARS package can be used for students in grade 6.

As an administrator, you need to:

* become thoroughly familiar with the program;

* duplicate for each teacher a copy of the worksheets and teacher commentary for that grade level, and then introduce the program at a faculty meeting early in the year;

* speak to parents at your school's first "open house" of the year, explaining the purpose of the program and the long-term value of their child working independently on the worksheets; and

* recruit or assign several assisting adults (volunteers, aides, etc.) who are enthusiastic, dependable people to manage the program. Early in the year, meet with the assisting adults to plan the following details:

    1. A prominent place and format for the STAR CHART.

    2. A place and time each Monday for the assisting adult to be in the school.

    3. A system for the activity sheets to be duplicated each week. They must be clear and legible.

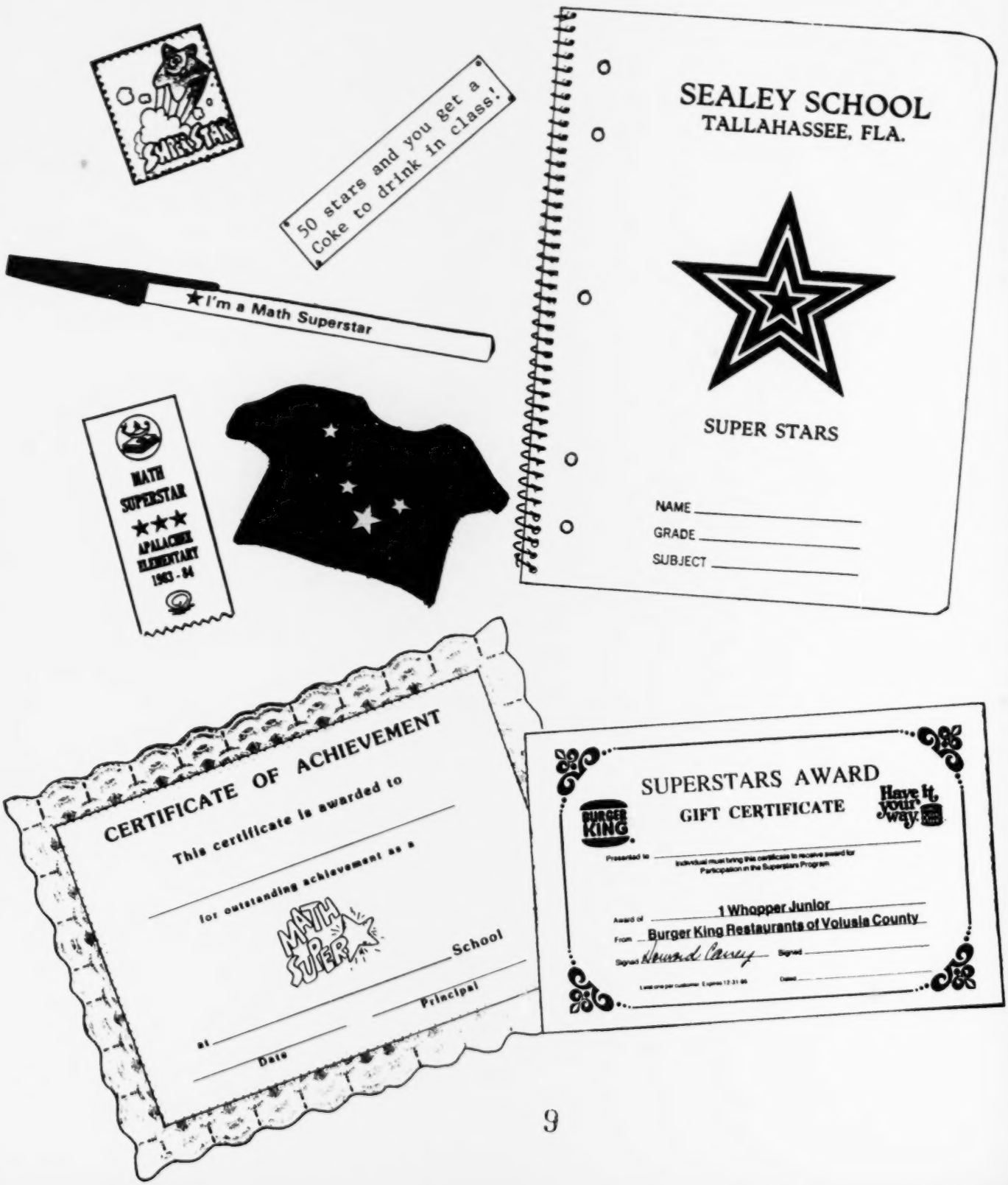
    4. A plan for extra incentives for accumulating stars. ("World records" to be kept from year-to-year, or a "brain bowl" planned for the end of school. Can students earn SUPERSTAR prizes for attaining certain levels of success? See the reverse side of this page for examples.)

    5. A schedule for when the program will start. Will there be opportunities later in the year for others to start? Will a new chart be started at the beginning of each quarter or each succeeding grading period? (Review a school calendar, and work backwards from the end of the year, using only weeks that have at least 4 school days. You'll need 25 weeks for the primary program, and 28 for the intermediate program).

* monitor the program every two weeks to clear up any unforeseen problems. Administrators need to be highly visible.

SUPERSTARS is an optional program for students. It should be available to any student who wants to try it, regardless of prior success in mathematics. You should expect to see a large group of students begin the program, but a

majority of them will lose interest. The small group that stays involved with SUPERSTARS over the full academic year are self-motivated students with good study habits, the sort most likely to become "excellent" students.



SUPERSTARS II: INFORMATION FOR ASSISTING ADULTS

SUPERSTARS II is designed to be managed by assisting adults and supported by teachers, administrators, and parents. The success of the program will depend on this team effort. Reliability and punctuality are important--students will rapidly learn to depend on the assisting adult being there each week, checking their papers, and posting their stars. If possible, wear an outfit that fits in with the SUPERSTARS logo; students will quickly begin to identify you as an important person in their school.

SUPERSTARS II works on a weekly cycle. Each Monday, you collect the worksheet from the previous week and distribute new worksheets to the participating students from your SUPERSTARS area in the school. You then check the worksheet from the previous week and post the stars earned on the STAR CHART.

Students have from Monday until Friday to work the problems entirely on their own--the only help they can receive is to have someone read the problems to them. On Friday, the teacher will host a problem-solving session in the classroom, discussing how to approach the more difficult problems. Students who have already worked the problems (prior to the problem-solving session) can earn double the number of stars--you can tell these by looking for the teacher's initials beside certain problems. The students will have from Friday until Monday to re-do those problems they did not understand--for these problems, they earn the indicated number of stars if they are correct.

There are a number of creative ways to format the STAR CHART. The basic method of posting stars one at a time will probably eventually yield to a color-coded system, or one that involves posting only 1 star per week, with a number inside it. Try to personalize the chart and the entire SUPERSTARS areas with pictures of the students, "smiling faces," etc. Be creative--your efforts will be rewarded by seeing enthusiastic students making progress toward mastering high-level thinking skills.

As an assisting adult, you will need to:

Plan with the principal the following:

1. A prominent place and format for the STAR CHART,

2. the time and place each Monday for you to take up and check papers and distribute new worksheets,

3. the system for duplicating each week's worksheets, ensuring legible copies, and

4. which, if any, extra incentives ("world records," stickers, coupons, pencils, tee shirts, etc.) will be part of the system for rewarding various levels of achievement in SUPERSTARS II.

Make the SUPERSTARS spot a happy place with bright colors, smiles, and cheerful words. Show confidence, friendliness, and encouragement to students.

Collect the letters, signed by the student and parent, which is sent home prior to the first activity sheet. If at any time you have good evidence that a student is getting help on the problems, mention it to the classroom teacher.

Check the worksheet from the previous week consistently. If you decide to give partial credit for a problem with several parts, award the stars consistently and be firm, but fair, in explaining this to students who question it. Do not give partial credit for problems with only one answer.

Allow students to see the answers to problems when they hand in a worksheet and to defend an answer that is different from the given answer. If they used clear logic in arriving at a unique answer, give them full credit.

Leave extra worksheets with the classroom teacher for students who were absent on Monday. Allow a worksheet to be turned in late only if the student was absent on Monday. If a worksheet does not have a student's name in the proper place, check the paper but award the stars to "No name" on the STAR CHART. Adhering strictly to these rules will teach responsibility to the students, and keep your work load manageable.

Keep all returned worksheets. Do not give them back to the student, since the same worksheets are used year-after-year.

On the Mondays when SUPERSTARS II will not be available (perhaps a vacation shortens the week too much), post a sign such as "No star problems this week, but come back next week, please!"

SUPERSTARS II: INFORMATION FOR TEACHERS

SUPERSTARS II is designed to help you teach the mathematics Skills of Excellence adopted by Florida's State Board of Education in 1984. It is intended to complement, not replace, your normal curriculum by offering peripheral opportunities to self-motivated students who frequently exceed the normal expectations.

The program is designed so that your involvement is strictly as a teacher. SUPERSTARS II will remain "special" to students if it's managed by someone outside the classroom setting, and if the teacher is viewed as a "helper" in the system, rather than as a dominant figure. Your primary role is to monitor the system in your own classroom and host a problem-solving session for SUPERSTARS students on Friday of each week.

A TEACHER COMMENTARY page accompanies each worksheet, and will tell you which Skill of Excellence is addressed by each problem. The Commentary will also give you hints on how to cover the problems in your problem-solving session, without actually giving away the answers. Even though there is a comment for each problem, you will have to decide which 3 or 4 problems you will cover during this brief session. Concentrate on those that require higher-level thinking!

Do not be disappointed if a large number of students in your class begin SUPERSTARS, but some of them drop out after a few weeks. This is a natural phenomenon; problem-solving requires a great deal from students, and only certain ones are ready to accept this sort of challenge. You will notice that certain students do choose to stay in SUPERSTARS week-after-week, even though they aren't as successful in earning stars as other students.

Please read the General Information in the SUPERSTARS package, to get an overview of the program. The back of this page contains some "helpful hints" that you might find useful in your work with SUPERSTARS II. The use of calculators is permissable. And finally, look over the first few student worksheets for your grade level so that in the weeks before the program starts in your school, you can review in class any terminology or symbolism that might be confusing to students.

SPECIAL NOTE FOR 6TH GRADE TEACHERS: The original version of SUPERSTARS contained worksheets for 6th graders, but SUPERSTARS II does not. To revise the 6th grade worksheets would have meant beginning on the "Skills of Excellence" for 8th grade, and having nothing to follow in grades 7 and 8. The decision was therefore to leave the 6th grade worksheets as they are presently listed in SUPERSTARS.

If SUPERSTARS II is being used in your school and your 6th graders want to participate, use the SUPERSTARS worksheets, grade 6 level.

Please keep these points in mind this year regarding SUPERSTARS II:

Allow your students to leave the classroom at the designated time on Mon-Monday morning to turn in their worksheets and pick up new ones.

Read each week's worksheet yourself, and feel free to structure classroom activities that parallel those on the SUPERSTARS worksheets. However, please do not "teach to the worksheets."

During the school week, students can work on SUPERSTARS during their spare time, but the only help they can receive is for some adult to read the problems to them. Give them one warning if you see them discussing the worksheets, and take away their papers for the next violation.

Host a brief problem-solving session for SUPERSTAR participants on Friday. Remember these points:

Students come to this session with their worksheets, but without pencils.

The session must be brief--15 minutes at most. Discuss only the 3 or 4 more difficult problems on the sheet.

Do not give answers to the problems. Rather, concentrate on approaches to the problems.

Help students summarize their own approaches to the problems, in a non-judgemental fashion. Offer your own approach last, and only when it's different from the student strategies.

End the session by encouraging students to complete the problems they haven't done, over the week-end. Put your initials beside any problem discussed in class which a student has already done, if the answer is correct. The assisting adult will award "double stars" for these.

Remember that part of the SUPERSTARS program is to teach responsibility. Students will rapidly learn to follow whatever rules structure a program, if the program is important to them. SUPERSTARS becomes very important to certain students, so they will adhere to rules about where their name goes on each paper, no credit if they forget their worksheet on Monday, no talking about the problems, etc., if you enforce the rules.

Enjoy SUPERSTARS. Students will impress you with their ability to think, and their creative ways to solve problems that seem to be above their level.

SUPERSTARS II: INFORMATION FOR STUDENTS

SUPERSTARS II is for kids who enjoy extra work, with very little pay! All you might get for this extra work are some stars on a chart. But at least your friends and parents will know that you're a SUPERSTAR, because your stars will be placed in the school where everybody can see them.

You can get a worksheet full of problems each Monday, and you'll have until Friday to do them in your spare time. Your classroom teacher will show you how to begin the harder problems on Friday, if you haven't already finished them. You can do those problems over the week-end, but on Monday you have to turn in the worksheet to get your stars. If you forget to turn in the paper, or to put your name on the paper in the right place, you won't get your stars!

You don't have to take a worksheet every week--if you get tired or want a vacation, you can skip a week. You also don't have to do every problem on each sheet. All worksheets should be turned in on Monday, even if only one problem is completed. Those completed by Friday earn double credit.

There is one big rule -- you can't talk about the problems with anyone until you have turned in the worksheet. (Your teacher and parents will know about this rule, too, and remind you.) An adult can read any problem out loud to you if you can't read it yourself. When you sign your name on the worksheet and turn it in, you are saying that you didn't receive any help or give any help to other students.

If you have read this letter and want to become a part of SUPERSTARS, sign below. Have your parents read the other side of this sheet and sign it also. Then turn this page in before you receive your first worksheet.

_____

Your signature

SUPERSTARS II: INFORMATION FOR PARENTS

Your child has indicated an interest in starting the SUPERSTARS II mathematics enrichment program. The purpose of the program is to help students become "excellent" students of mathematics, over a several-year time period.

Most of SUPERSTARS II is problem solving. Your child will be given a worksheet full of problems on Monday, and have until Friday to solve them completely on his/her own. You can read the problems to your child if he/she is having difficulty with the words, but that is the only help you can give. On Friday, the teacher will discuss how to approach the more difficult problems. Your child will then have the week-end to re-do the harder problems before turning the worksheet in on Monday. The advantage to doing the problems by Friday is that the child receives <u>double credit</u> for doing them prior to getting help.

How can you help your child be successful with SUPERSTARS? Perhaps the best way is to establish a work schedule that allows enough time each week to think about the problems prior to Thursday night. A schedule like the one below often helps:

Monday night:	The child reads all the problems, to understand the problem situations.
Tuesday night:	The child reads all the problems again, and does the easy ones.
Wednesday night:	The child reads the remaining problems again, and tries one or two harder ones.
Thursday night:	The child finishes the worksheet, doing as much as he/she can.

Help your child understand that he/she will rarely be able to do all the problems on a worksheet prior to the Friday "help session." But learning how to approach the harder problems will pay off in the end, since he/she will see problems like them in the future.

SUPERSTARS II is entirely optional for students. When the "lure" of participating in a new program begins to wear off and students realize how difficult some of the problems are, some will lose interest and drop out. This is a natural phenomenon and reflects that SUPERSTARS is for self-motivated students with good work habits. If your child decides to discontinue SUPERSTARS, allow him/her to do so in a non-judgemental fashion--perhaps they'll pick it up again later on their own, when they're ready for this type of experience. As long as he/she is participating in SUPERSTARS, remain interested in their progress but not "pushy" about the program.

If you agree for your child to begin SUPERSTARS II, sign below:

_____

Parent's signature

WORKSHEETS

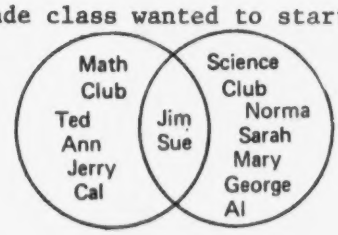
FOR

GRADE 4

Star Problems
Grade 4, I

I have neither given nor received help on these problems: _____

★★★★ 1. The students in Mr. Renick's 4th grade class wanted to start a math club and a science club. They drew a circle diagram to show which students wanted to be in each club. Use the circle diagram to the right to answer these questions about the clubs.



(a) How many students wanted to join the math club? ____

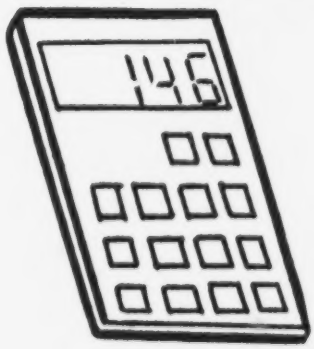
(b) How many students wanted to join the science club? ____

(c) How many students wanted to join both clubs? ____

(d) If Mr. Renick's class had 27 students, how many were not interested in joining either club? ____

★★ 2. Henry was at the store, and used his calculator to add up the price for 2 loaves of bread. He got the number shown on the display, but didn't know exactly how much money that was. How much money would those two loaves cost? Circle the best answer below.

(a) $146
(b) 1.46¢
(c) $146.00
(d) $1.46



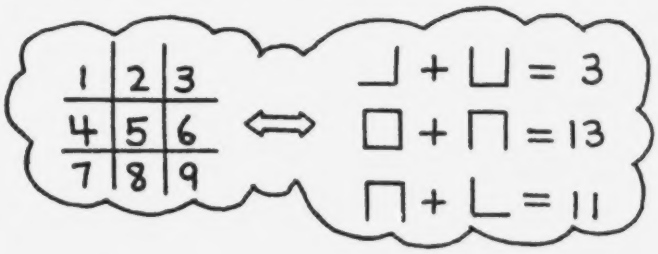
★ 3. In the picture to the right, how many squares have been outlined by the white lines?

Answer: ____ squares

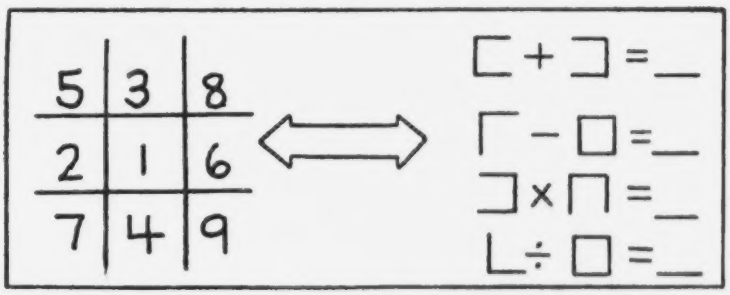
★★ 4. Sheila's Mom baked 5 pies for her birthday party. Each person who came to the party got one piece, and all the pieces were the same size. The pie that was left over is shown below.

How many people came to her party? ☐

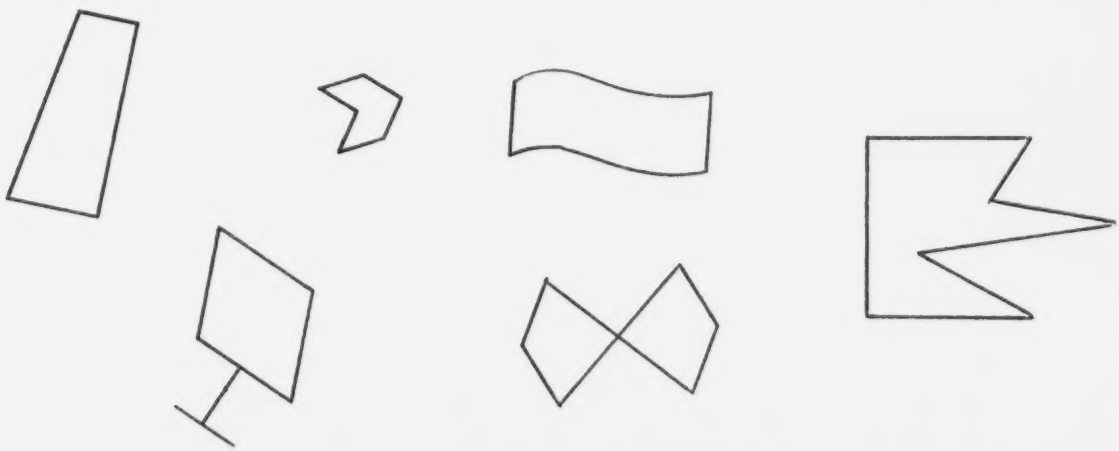
★★★ 5. Look at the example given below:



Now try this. Write your answer on the line.



★★ 6. A *polygon* is a simple closed figure made entirely of line segments. ("simple" means it doesn't cross itself; "closed" means it doesn't have any "loose ends" sticking out somewhere.) Circle the figures below that are polygons.



★ 7. If the 9th day of a month is on Tuesday, on what day is the 25th? _____

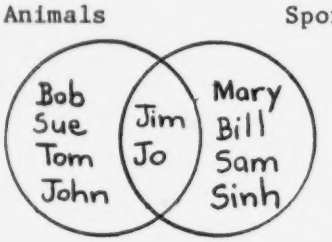
★★★ 8. The sum of two whole numbers is 60. Their difference is 24. What are the two numbers?

Answer: ____ and ____

STAR PROBLEMS
Grade 4, II

I have neither given nor received help on these problems._____

★ 1. Find the students reading books about animals and sports.



The students reading about animals are Bob, Sue, Tom, John, Jim and _____.

The students reading about sports are Jim, Jo, Sinh, _____, _____ and _____.

The students who read about animals and sports are _____ and _____.

★ 2. You earn $1.00 each week raking leaves. Using six coins, how could you be paid $1.00?

Answer:_____

★★ 3. Estimate the solutions below. Circle the best answer.

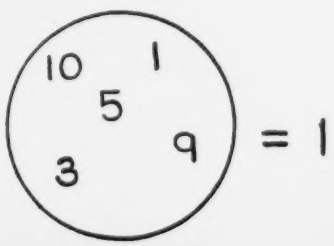
$$\begin{array}{r} 2\ \frac{8}{9} \\ +\ 3\ \frac{1}{99} \\ \hline \end{array}$$

a. 5
b. 4
c. 6

$$\begin{array}{r} 6\ \frac{75}{78} \\ -2\ \frac{50}{53} \\ \hline \end{array}$$

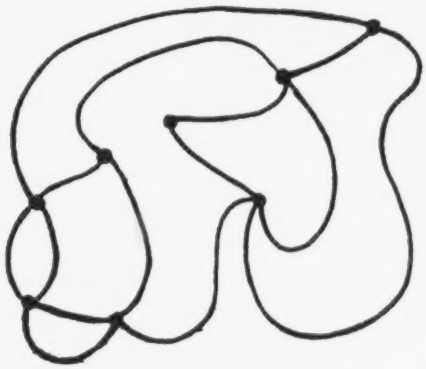
a. 6
b. 4
c. 5

★★★ 4. Use all of the digits below once, to find an answer of 1. Use some or all of these symbols: +, -, x, ÷ .



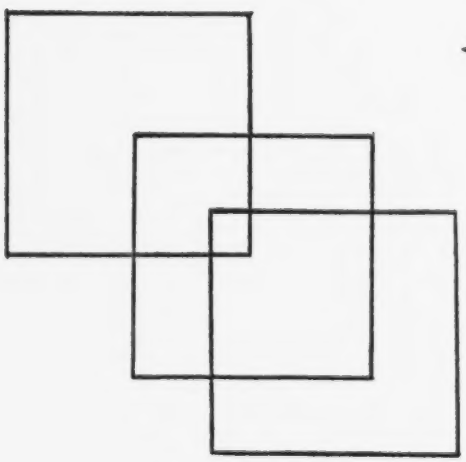
Answer: _____ = 1

★★★ 5. You can trace over the figure below with a pencil without retracing any path, if you start in the right place. Find the two places where you can do this, and draw circles around them.



★ 6. Use a calculator to solve this problem.

9 x 8 x 7 x 6 x 5 x 4 x 3 x 2 x 1 = _____



★ 7. How many squares? _____

★ 8. Solve this problem without a calculator:

9 x 8 x 7 x 6 x 5 x 4 x 3 x 2 x 1 x 10 = _____

Star Problems
Grade 4, III

I have neither given nor received help on these problems: _____

★★★ 1. Jane bought a sweater for her Mom for $24.97, a coat for her Dad for $37.88, and a watch for her brother for $16.00. Sales tax in Florida is 5¢ on every dollar--the tax on amounts less than a dollar can be found from the chart to the right.

(i) How much did she have to pay for her purchases, counting tax? _____

(ii) If she paid for the gifts with five twenty-dollar bills, how much change should she receive? _____

Amount of purchase	Tax
$0.01 - 0.10	0¢
.11 - .27	1¢
.28 - .47	2¢
.48 - .68	3¢
.69 - .89	4¢
.90 - 1.09	5¢

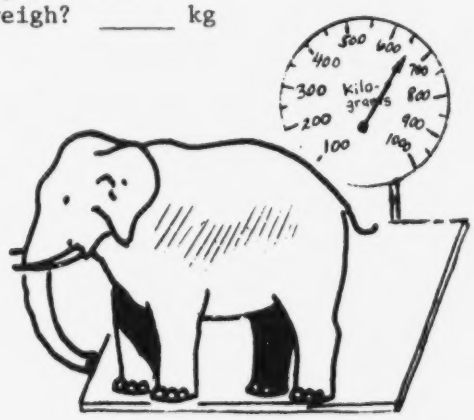
★ 2. Place the missing digits in the boxes below:

$$\begin{array}{r} 4\,\square\,6\,8 \\ 5\,\square\,6 \\ +\ \square\,9\,4\,\square \\ \hline 1\ 1,1\ 1\ 1 \end{array}$$

★★ 3. The monthly rainfall in Miami during August was 5½ inches. For the 3 months before that, the rainfall each month was 4 inches, 2½ inches, and 4 inches. What was the monthly average for rainfall for Miami, during those 4 months?

Answer: ___ inches

★ 4. How many kilograms does "Elephante" weigh? _____ kg



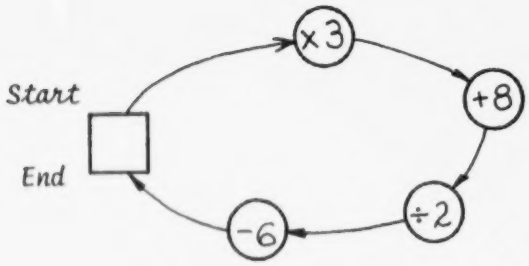
★★ 5. How many grams would "Elephante" weigh?

Answer: _____ grams

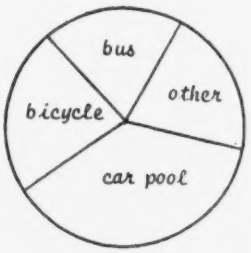
★★★★ 6. Jan's age is 3 times Pam's age, Sue is twice as old as Pam. The sum of their ages is 30. How old is each girl?

Answer: Jan is ___; Pam is ___; Sue is ___.

★★ 7. If you guess the right number to start with, and do the arithmetic shown, you will end with the same number you started with. Write this number in the box.



★★ 8. The graph below shows the way the children at Ocean View Elementary School travel back and forth each day. Answer the questions to the right.



(a) What is the method of transportation that most students use? _____

(b) About what percent of the children ride bicycles to school? Bubble-in the best estimate.

○ 50% ○ 75% ○ 25% ○ 10%

★★ 9. For the two problems below, look for a pattern to find out the number that replaces the question mark. Write that number beside the question mark.

1st problem: 3 7 4 6 2 4 3 3 8 5 4 ?

2nd problem:

3	8	2	3	6	9	4	5	?
12			2			10		

★★ 10. Use the pictograph below to answer these questions:

(a) How many gold medals did Poland win? ____

(b) How many more gold medals did the U.S.S.R. win than the United States? ____

Top Six Countries
Receiving Gold Medals in the Summer Olympics

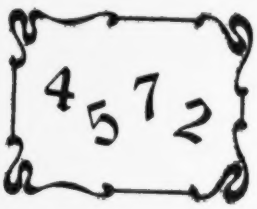
Country	Gold Medals
U.S.S.R.	○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ◔
E. Germany	○ ○ ○ ○ ○ ○ ○ ○ ○
United States	○ ○ ○ ○ ○ ○ ○ ◑
W. Germany	○ ○ ◑
Japan	○ ○ ◔
Poland	○ ○

Key: ○ = 4 Gold Medals

Star Problems
Grade 4, IV

I have neither given nor received help on these problems: _____

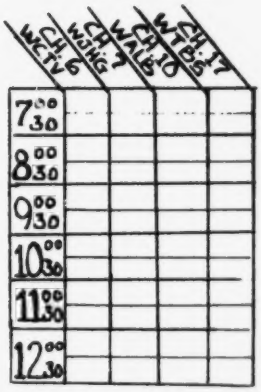
★★★ 1. How many different 4-digit numerals can you make, using the digits to the right? (You can only use a digit 1 time in a numeral.)



Answer: ____ numerals

★ 2. Place the correct letter of the t.v. program in its corresponding time space on the t.v. schedule. They are all half-hour programs.

TV SCHEDULE:



PROGRAM LISTINGS:

A. 8:00...Channel 10...TODAY SHOW
B. 10:00..Channel 6....PRESS YOUR LUCK
C. 7:00...Channel 17...I DREAM OF JEANNIE
D. 11:00..Channel 7....MISTER ROGERS
E. 10:00..Channel 10...THE FACTS OF LIFE
F. 10:30..Channel 17...BENSON
G. 7:30...Channel 6....GOOD MORNING
H. 9:00...Channel 7....DREAM HOUSE
I. 12:00..Channel 10...MIDDAY REPORT
J. 8:30...Channel 17...I LOVE LUCY

★★★★ 3. Tell whether or not each of these problems would give an *odd* or *even* answer. You shouldn't have to do any computation, but you might have to think quite a bit to decide.

3,546,311 + 49 + 7,483 + 893,103 would give an ____ number.

3,563,211,002 - 9,544,293 would give an ____ number.

675,312 X 43,298,713 would give an ____ number.

943,271,001 ÷ 3 would give an ____ number.

★★★ 4. Your heart beats about 72 times per minute, on the average. About how many times will it beat in a 30-day month, at this rate?

- A. 30 million times
- B. 31 million times
- C. 2 thousand times
- D. 3 million times

★★★ 5.

The number has 3 digits.

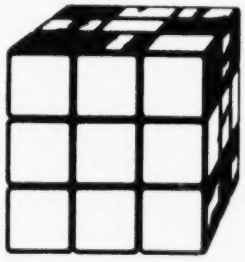
The tens digit is half the hundreds digit.

The number is odd.

The sum of the digits is 9.

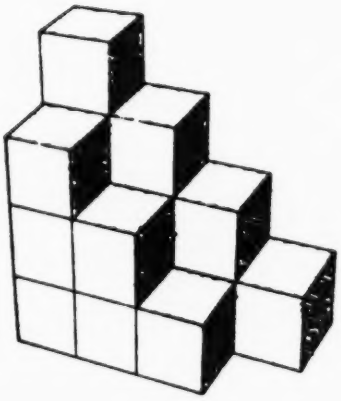
Answer: The number is _____.

★★ 6. You probably have a Rubik's Cube, like the one to the right. Each of the colored squares on this one is 1 centimeter on the edge. How many colored squares like this are there on a Rubik's Cube?

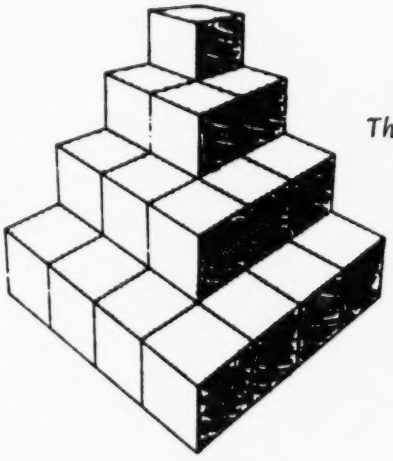


Answer: The *surface area* of this Rubik's Cube is ___ cm^2.

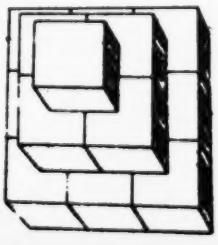
★★★ 7. The *volume* of a shape is the number of cubes it would take, all the same size, to make the figure. Each figure below is made of cubes that are 1 centimeter on each edge. Count the cubes to find the *volume* of each one.



The volume is ___ cm^3.



The volume is ___ cm^3.

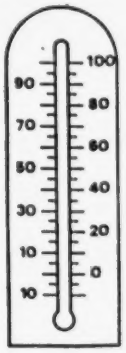


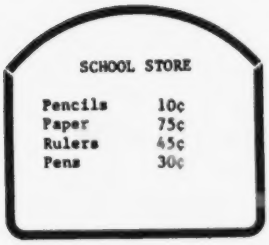
The volume is ___ cm^3.

Star Problems
Grade 4, V

I have neither given nor received help on these problems: _____

★★ 1. Julio noticed the temperature at 3:00 P.M. was 15° C. He heard that night that the temperature had dropped 20°. Show on the thermometer what the new temperature would be.





★ 2. Tamika bought paper and two pens at the school store. She received 15¢ change. How much money did she give the clerk?

Note: School stores don't charge tax.

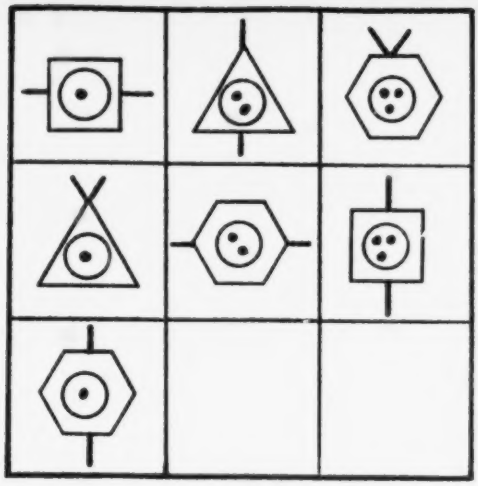
Answer: _____

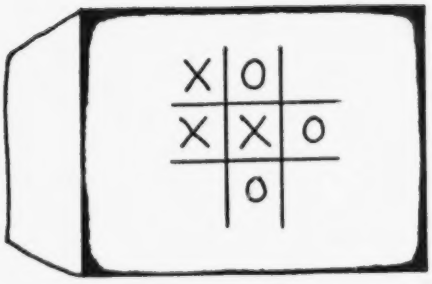
★★ 3. Fold this piece of paper so that the "fold line" is *perpendicular to* the line segment below, and runs through the point X. (You can do this easily if you hold the paper up to the light, and be sure that one side of the segment falls on top of the other one.)

★ 4.
$$\begin{array}{r} 5\,7\,6\,8\,0\,4\,0\,9\,9\,8\,5\,7\,6\,7\,5\,5\,1 \\ 7\,6\,3\,8\,9\,2\,1\,4\,7\,6\,3\,8\,9\,6\,4\,2 \\ 3\,9\,6\,5\,2\,0\,0\,3\,9\,6\,4\,3\,0\,1 \\ 1\,0\,3\,7\,6\,9\,9\,2\,4\,3\,4\,5\,6 \\ 7\,1\,1\,2\,4\,9\,6\,0\,7\,5\,4\,0\,2\,3 \\ +\quad 9\,6\,3\,7\,5\,0\,4\,2\,4\,2\,3\,7 \\ \hline \end{array}$$

★ 5.
$$\begin{array}{r} 5\,8\,4\,8\,4\,8\,7\,5\,0\,0\,0\,1\,9\,4\,7\,5 \\ -\,8\,0\,1\,8\,4\,6\,9\,4\,9\,5\,5\,3\,0\,7\,0 \\ \hline \end{array}$$

★★★ 6. Draw the missing shapes in the boxes to the right.





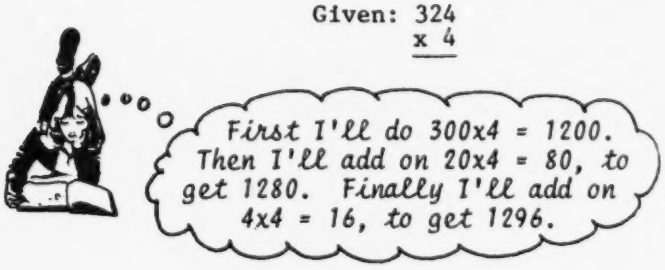
★★ 7. Thomas is playing tic-tac-toe with a computer. It is the computer's turn to place an "X" on the board. If the computer makes its moves at random in the open spaces, what is the chance it will win on this move?

Answer: ☐

★★ 8. What is the chance the computer will <u>not</u> win on this move?

Answer: ☐

★★★★ 9. Most people who learn to multiply mentally will do the exact opposite of those who use paper and pencil. They'll multiply with the larger numbers first, and then move on to the smaller products, because it's easier to add smaller numbers to larger ones, than the other way around. Study how Patti is working below.



When you think you understand how to multiply this way, practice on the problems below. Check your mental work using a calculator to see if you are correct.

Practice problems:	234	363	405	521	623	710	352	707
	x 2	x 2	x 3	x 4	x 4	x 5	x 3	x 6

When you hand in your paper, you'll be given a problem similar to these--if you can do it in your head, you'll get your stars!

Answer later on: ☐

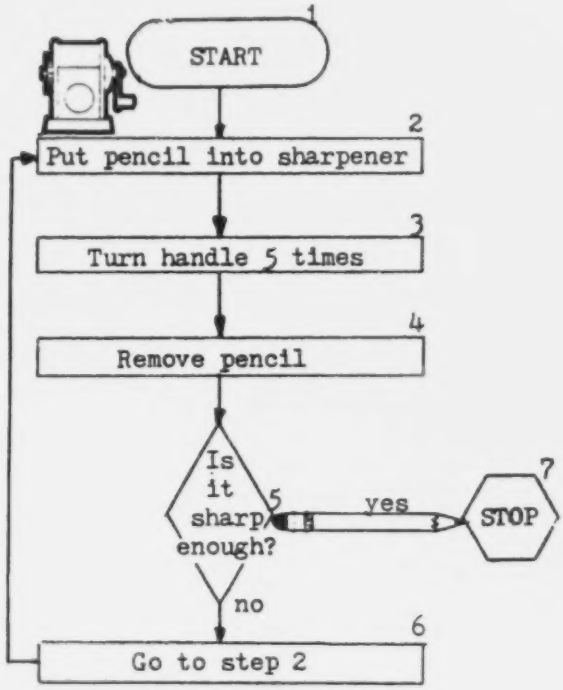
Star Problems
Grade 4, VI

I have neither given nor received help on these problems: _____

★★ 1. Jason was sharpening his pencil using the flowchart to the right. He had to check his pencil 3 times before it was sharp enough.

How many times did Jason turn the handle?

Answer: __ times



★★ 2. Maria also sharpened her pencil using the flowchart. She turned the handle 45 times--Wow!

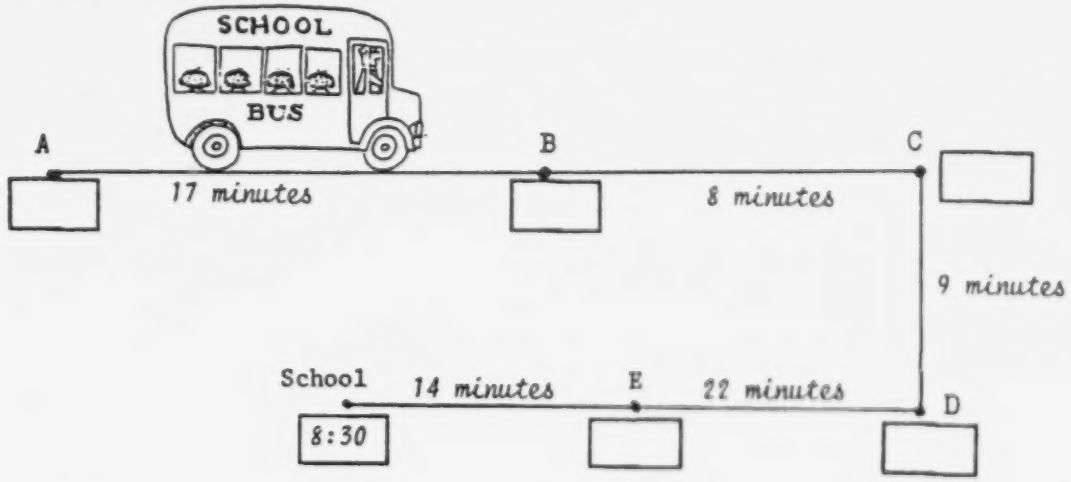
How many times did she remove the pencil and check it?

Answer: __ times

★ 3. Find the product of the ten one-digit numbers.

Answer: ____

★★ 4. The map below shows a school bus route with 5 stops. The time it takes to go from one stop to the next is given. Write the time it arrives at each stop in the empty boxes.

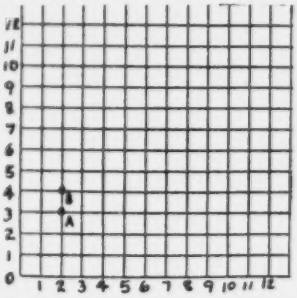


★ 5. The man walking on the large piece of glass is an average size adult. About how tall do you think he might be? Bubble-in the best estimate.

- ⬭ 1 meter
- ⬭ 2 meters
- ⬭ 3 meters
- ⬭ 4 meters

★★★ 6. On the graph paper, place dots on the following points--the first two have been done for you. Then connect the points in order from A to L. You should have a picture when you finish.

A.	(2,3)	G.	(9,4)
B.	(2,4)	H.	(9,3)
C.	(5,4)	I.	(12, 3)
D.	(5,6)	J.	(11, 1)
E.	(7,6)	K.	(2,1)
F.	(7, 12)	L.	(1,3)



★ 7. A professor claimed to have invented a liquid that would dissolve anything. He kept it in a jar like the one to the left.

What is wrong with his claim? _____

_____.

★★★★ 8. To make a 3-layer cake, you would need ½ cup of sugar. How much sugar would you need to make a 1-layer cake?

Answer: You'd need __ cup of sugar.

Hint: Draw a picture of the ½ cup of sugar, and the 3-layer cake.

★★ 9. Fill-in the squares with the right numbers.

$$\begin{array}{r} \square 0 \square 0 \\ -\ 38\square \\ \hline 4\square 11 \end{array}$$

Star Problems
Grade 4, VII

I have neither given nor received help on these problems: _____

★★ 1. The height of several mountains is given to the right. About how many miles high is the smallest one? _____ miles

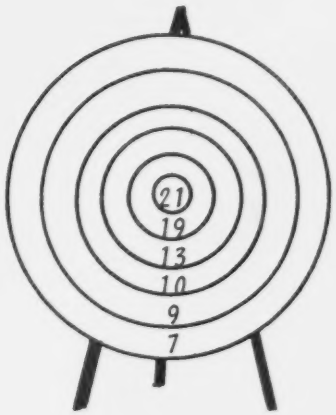
About how many miles high is the tallest one? _____ miles

Mt. McKinley (20,300 feet)
Mt. Aconcaqua (22,834 feet)
Mt. Elbruz (18,468 feet)
Mt. Everest (29,141 feet)
Mt. Kibo (19,710 feet)
Mt. Nilson (15,400 feet)

Recall that a mile is 5,280 feet!

★ 2. Apalachee Elementary School has a total of 16 classes. There are 104 fourth graders, divided equally among 4 classrooms. How many fourth graders are in each classroom?

Answer: _____



★★★ 3. Draw 3 arrows to show a total score of 39 points, but use only *prime numbers*.

A *prime number* can't be divided by any number smaller than itself, except 1.

★ 4. The watch to the right is one of those weird ones that moves *counterclockwise* (backwards). What time will it be, according to this watch, in 3½ hours?

Answer: It will be _____.

★★ 5.
3 hours 19 minutes
- 1 hour 45 minutes

★★★★ 6. Connie did some baby-sitting for a neighbor--she made $1.50 per hour, for 6 hours. Then she bought a beach ball, a snorkel, and some swim fins at a "½ off the regular price" sale.

If you forget about the sales tax, how much would she have left from her baby-sitting money?

Answer: _____

★ 7. Put <, >, or = in each box below, to give true statements.

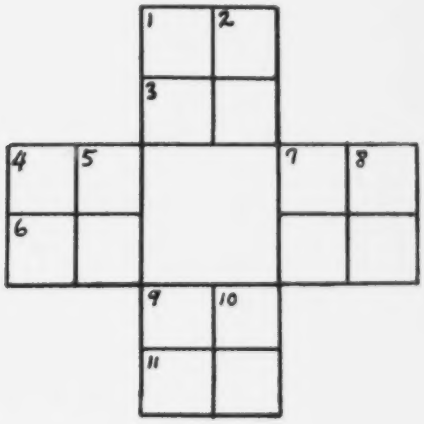
(A) 1009 ☐ 1090

(B) 189,400 ☐ 189,004

(C) (384+492) ☐ 874

(D) (4095+2687-3979) ☐ 2803

★★ 8. Crossnumber puzzle--solve each problem to complete the puzzle.



ACROSS

1. (2 x 3) + (4 x 3)
3. (66 - 56) x (81 ÷ 9)
4. (32 + 8) + (2 x 7)
6. (48 ÷ 2) - 0
9. (2 x 3) x (4 ÷ 2)
11. (2 + 4 + 2) + (2 + 0)

DOWN

1. (39 + 39) - (50 +9)
2. (10 + 10 - 10) x (4 x 2)
5. (3 x 5) + (50 -21)
7. (11 x 4) ÷ (1+1)
8. (65 + 23 - 5) - (5 x8)
10. (2 x 10) + (30 - 30)

STAR PROBLEMS
Grade 4, VIII

I have neither given nor received help on these problems:_____

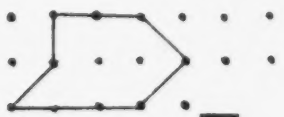
★★★ 1. Place the other letters of the alphabet above or below the line given below, using the same rule that was used for A through I.

A E F H I
B C D G

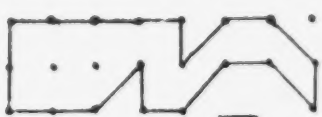
★★ 2. Find a pair of numbers for each sum and product. Write your answers in the □ 's.

NUMBERS	SUM	PRODUCT
Example → 5 , 3	8	15
□ , □	10	24
□ , □	12	20
□ , □	14	48
□ , □	16	63
□ , □	18	45

★★ 3. The area of a figure is the number of unit squares it would take to cover it up. Find the area of each figure below, if a unit square looks like ■.

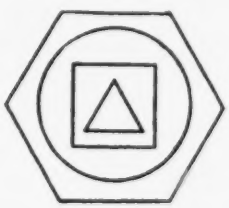


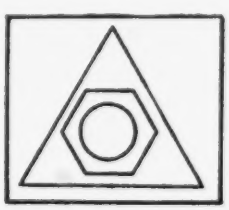
Answer: ___ ■s



Answer: ___ ■s

★★ 4. What would the next shape look like? Draw it on the line.





_____

★★★★ 5. Steve, Margie, Robbie, and Frankie all eat lunch in the same restaurant. All of them are eating there today, but Steve eats there every day. Margie eats there every other day, Robbie eats there every third day, and Frankie eats there every fourth day.

The next time they are all together in this restaurant, they will have a big celebration. How many days from today will the celebration take place?

Answer: ___ days

Hint: Organize your thoughts by making a list or chart of the days, and who'll be there!

★★ 6. Fill in the blanks. YEAR YOU WERE BORN:_____
AGE TODAY:_____

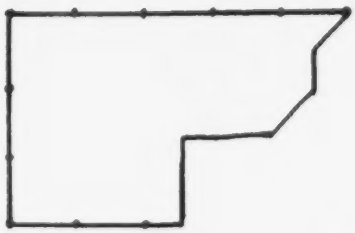
Now, use your calculator to compute the steps below.
a. Enter the year you were born
b. Multiply it by 5
c. Now add 25
d. Multiply by 20
e. Add your age
f. Then add 365
g. Subtract 865
The answer that appears on your calculator is:_____

★★ 7. What number is as much greater than 36 as it is less than 94?

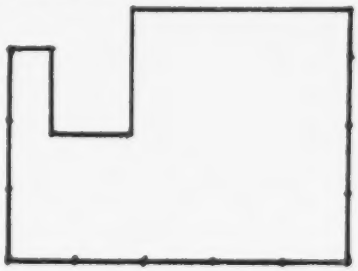
Answer:_____

★★★ 8. For each figure below, circle the best estimate of the area of the figure.

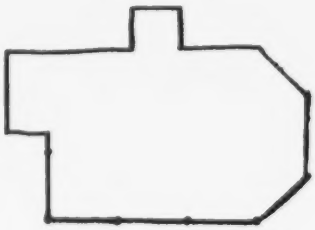
Hint: Place some cm^2 graph paper over the figures, or "draw in" some square centimeters.



a. 9 cm^2
b. 11 cm^2
c. 15 cm^2



a. 20 cm^2
b. 11 cm^2
c. 16 cm^2



a. 12 cm^2
b. 9 cm^2
c. 13 cm^2

Star Problems
Grade 4, IX

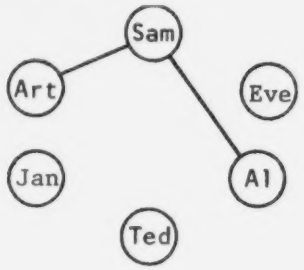
I have neither given nor received help on these problems: _____

★★ 1. Mario got his allowance on Monday. He spent 25% of it on Tuesday, 15% on Wednesday, and 10% more on Thursday. What percent of his allowance did he have left on Friday?

Answer: ___ %

★★ 2. Six students held a computer contest, and each person had to play every other person one time. How many of the contests did they have to schedule?

(Hint: Complete the drawing. Two contests are shown by the lines connecting Sam to Art and Al.)



Answer: __ games were played.

★★★ 3. Below is a bus schedule showing departure times and arrival times from various cities in Florida to Ft. Lauderdale. How much time does the longest trip take?

Answer: _____

Bus Schedule

Departures		Arrivals	
Jacksonville	8:30 a.m.	Ft. Lauderdale	3:00 p.m.
Tallahassee	7:30 a.m.	Ft. Lauderdale	7:00 p.m.
Tampa	10:00 a.m.	Ft. Lauderdale	3:00 p.m.
St. Augustine	8:00 p.m.	Ft. Lauderdale	4:00 a.m.

★★★ 4. In the last olympics, the United States mile relay team had the following times for the four men who ran the race:

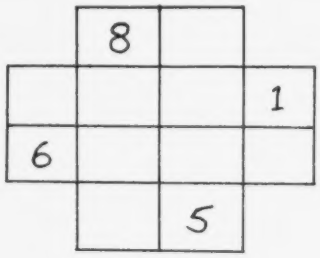
1st man: 49.42 seconds
2nd man: 48.36 seconds
3rd man: 47.98 seconds
4th man: 48.20 seconds

Which of the four men ran the fastest leg of the race? _____

What was the total time for the team, for the mile? ___ minutes and ___ seconds

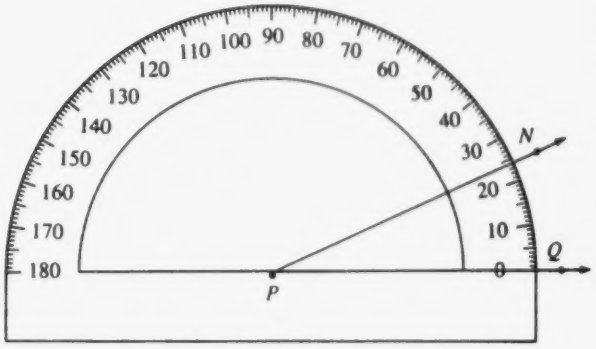
What was the total time, rounded off to the nearest tenth of a second? _____

★★★ 5. Put each of the numerals 1 through 12 once in each of the boxes below so that each of the two rows, and each of the two columns, has a sum of 26. A few numbers have already been put in for you.

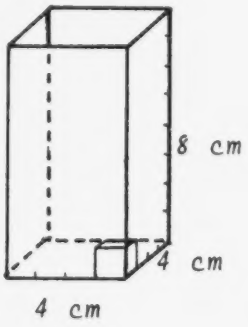


★★ 6. A *protractor* can be used to find out how large an angle is. Angle NPQ to the right measures 24 degrees.

On the *protractor*, make an angle TPQ that measures 45 degrees. Then make an angle SPQ that measures 135 degrees.



★★ 7. The *volume* of the box below is the number of cubes it would take to fill it up. If each cube is a centimeter on the edges, the volume would be given in *cubic centimeters*. What is the volume of the box?



Answer: ____ cubic centimeters

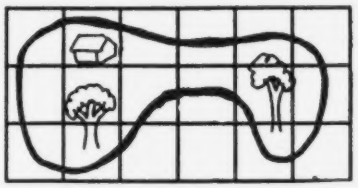
★ 8. Mr. Hale, an insurance salesman, drove 450 miles one day while visiting clients. He drove 50 miles per hour for 8 hours and 40 miles per hour for 1¼ hours. How many miles did Mr. Hale drive in all?

Answer: ____ miles

STAR PROBLEMS
Grade 4, X

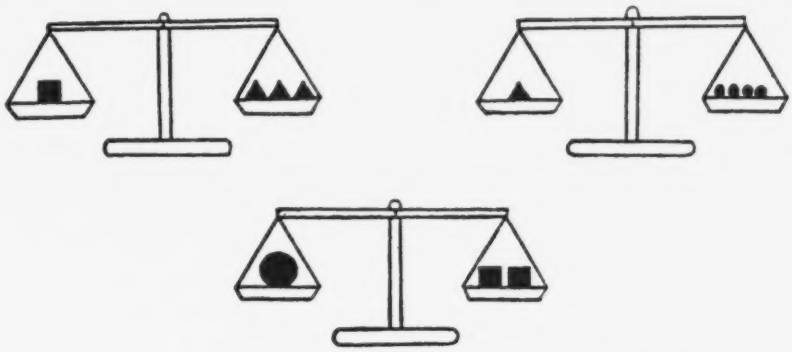
I have neither given nor received help on these problems._____

★★ 1. Estimate the area of the island if one square unit is equal to 1 km^2. Circle the best estimate.



A. about 17 km^2
B. about 12 km^2
C. about 8 km^2
D. about 5 km^2

★★★ 2. Study the three balance scales shown below.



If each ● has a mass of 1 gram, what is the mass of the ● ?

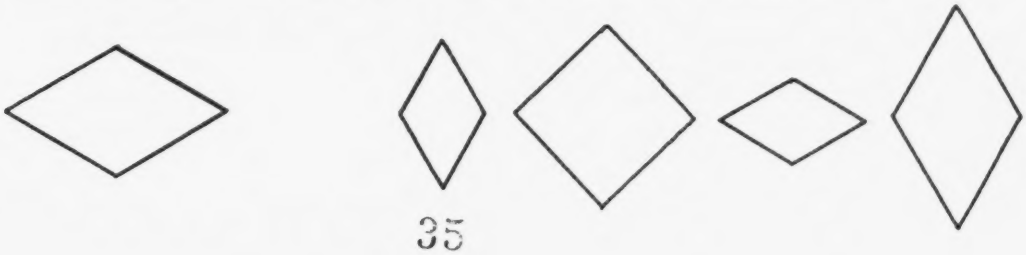
Answer: _____ grams

★★ 3. Andrea wants to take a computer class. She already has dance lessons on Monday and Thursday afternoons from 3:30 till 4:40. She also has cheerleading practice on Wednesday nights from 7:00 till 8:30. Which of the following two hour computer classes could she take? Write the letter of the class.

Class A. Monday and Wednesday starting at 3:00 pm
Class B. Tuesday and Thursday starting at 6:00 pm
Class C. Wednesday and Friday starting at 7:00 pm

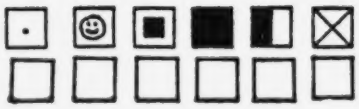
Answer:_____

★ 4. Circle the figure to the right that is a *turn* of the one to the left:



★★★★ 5. The pictures below all show the same block, but seen from a different view each time

What design is opposite each of these sides?

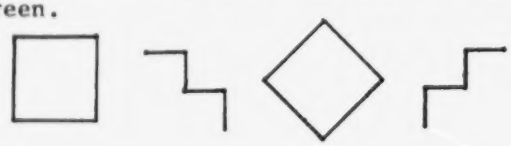


Answer:

★★ 6. Steven was using a computer to teach the Logo turtle TO PICTURE. He told the turtle to follow these steps:

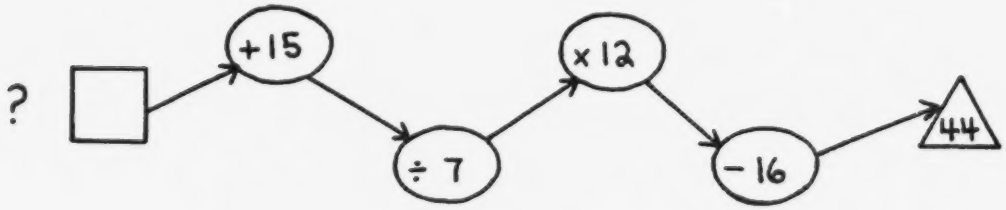
```
FORWARD  20
RIGHT 90
FORWARD 20
LEFT 90
FORWARD 20
RIGHT 90
FORWARD 20
```

Circle the design that appeared on the screen.



★ 7. If you begin with a certain two-digit number and follow the arrows, you will end with the number 44 shown in the △ .

Write the starting number in the □ .



★★★ 8. Betty, William, Marcus, Juanita, and Sam all made the finals of the national spelling bee last year. Before the final round began, each one had to shake hands with all the others. How many handshakes were there?

Answer: There would be ___ handshakes in all.

STAR PROBLEMS
Grade 4, XI

I have neither given nor received help on these problems._____

★★ 1. Sam used his computer to practice his mathematics skills. Yesterday he completed 20 examples in 10 minutes. He was happy because he got 15 of the examples correct. What fractional number, in simplest form, tells how many of the examples he got correct?

Answer: _____

★★★★ 2. Suzy bought 2 of the items from the menu. She paid 5¢ sales tax. When she gave the cashier $1.00, she received 20¢ in change. What two items did she buy?

Answer: _____

and

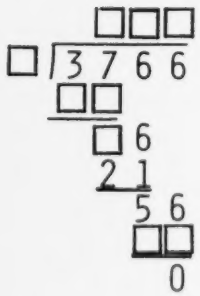
_____

* MENU *			
Hamburger	.85	Milk	.20
Hotdog	.70	Soft drink	.15
Grilled cheese sandwich	.55	Milk shake	.45
French fries	.40	Ice cream	.40

★ 3. Circle the air temperature where most people go swimming.

0°C 25°C 50°F

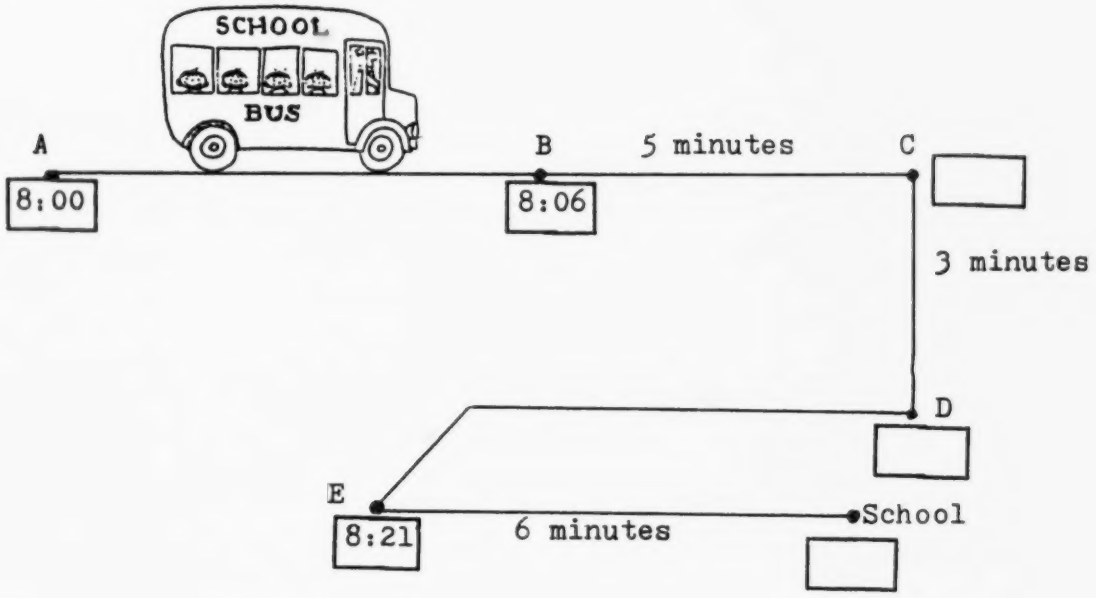
★★★ 4. Fill in the missing numbers in the puzzle to the right.



★★ 5. List all the whole numbers that would make this sentence true:

$27 + x \leq 30$ Answer: _____

★ 6. The map below shows part of a school bus route with 5 stops. Fill in the missing times.



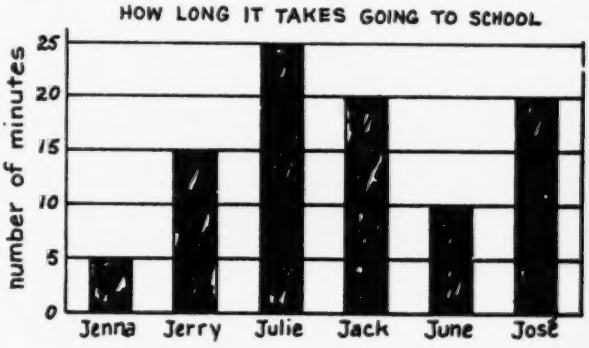
★★ 7. Look at the graph below and answer the questions.

a) When does Jerry get to school if he starts at 8:30?

Answer:_____

b) If Julie and June start at the same time, who gets to school first?

Answer:_____



★★ 8. Use a calculator and start adding the whole numbers in order (or, start adding 1 + 2 + 3 + 4 + ...). What is the number you add that gets your sum above 1000?

Answer: _____

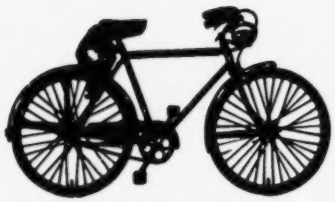
STAR PROBLEMS
GRADE 4, XII

I have neither given or received help on these problems: _____

★★★ 1. You have one quarter, one dime, one nickel, and two pennies. You could buy something that costs 7¢ by using the nickel and the pennies. You could buy something that costs 30¢ by using the quarter and the nickel. How many different priced things could you buy that cost exactly as much as some of the coins you have?

Answer: ☐

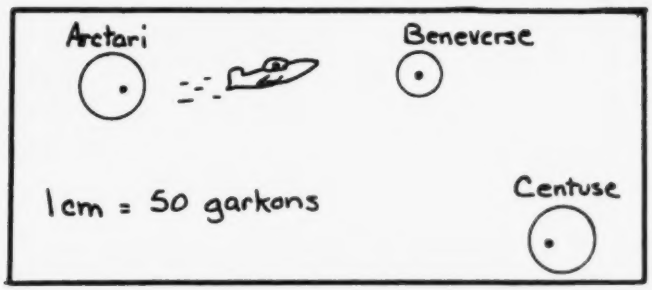
Hint: Make a list



★★ 2. Ann needs a new headlight for her bike. The one that she wants costs $9.99. The tax will come to 50¢. She has already saved $2.00 toward it. Ann earns $1.00 an hour for babysitting. How many hours must she babysit to earn enough money to buy the headlight?

Answer: _____ hours

★★ 3. Look at the picture below. Estimate how many garkons a spaceship would travel on a delivery trip from Arctari to Beneverse to Centuse and back to Arctari?



Circle your answer.
A. 500 garkons
B. 700 garkons
C. 900 garkons
D. 200 garkons

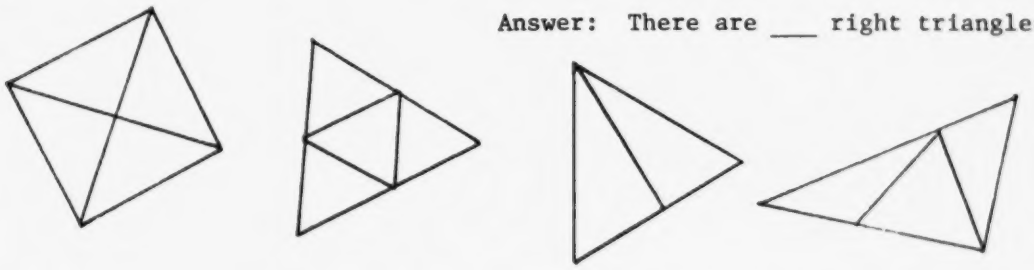
★★★★ 4. In BASE TWO, you are only allowed to use the digits 0 and 1 to write numbers. So you are forced to think of grouping (sticks, or whatever you're counting) whenever you get *two* of something, rather than when you get *ten* as in our own system.

See if you can complete the next few BASE TWO numerals in the chart below, to go with our regular BASE TEN numerals shown.

BASE TWO	BASE TEN	BASE TWO	BASE TEN
0	0	_____	9
1	1	_____	10
10	2	_____	11
11	3	_____	12
100	4	_____	13
101	5	_____	14
110	6	_____	15
111	7	_____	16
1000	8		

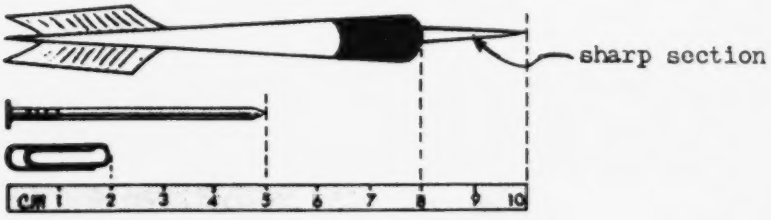
★★ 5. A *right triangle* is a special triangle; it's one that has a *right angle* in it. How many *right triangles* can you find below?

Answer: There are ___ right triangles below.



★ 6. Look at the picture below. How much longer is the nail than the sharp section of the dart?

Answer: ___ centimeters longer



★★★ 7. If you multiply 1 x 2 x 3 x 4 x 5 x 6 x 7 x 8 x 9 x 10 on a calculator, you'll see that it is a number that has 2 zero's on the right end. How many zeros will there be if you multiply together all the whole numbers from 1 to 20? _____ How many zeros for the numbers from 1 to 30? _____

8. Find two dice around your house, and consider the sum of the numbers that land on the "up faces" when you roll them. Roll the pair of dice 50 times, and keep a tally of the sum that comes up each time, using this chart:

★ A. What total was thrown most often? _____

★ B. What total was thrown least often? _____

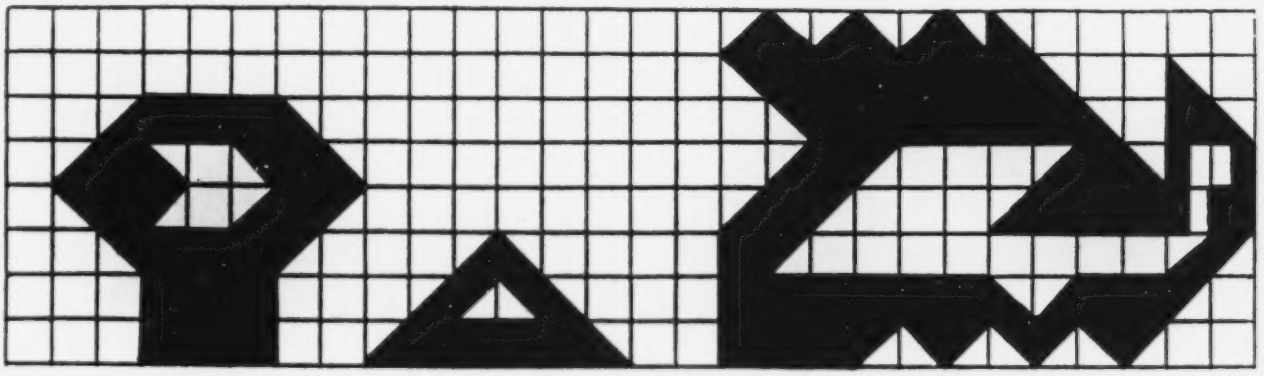
★★★ C. In the last column of the chart, write the chance of throwing each sum. Using your data, that chance should always be a fraction with 50 as the denominator.

sum	tally	chance
2		50
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		50

STAR PROBLEMS
Grade 4, XIII

I have neither given nor received help on these problems: _____

★★ 1. Find the area of the figures below; notice that each figure has a "hole" cut in it.



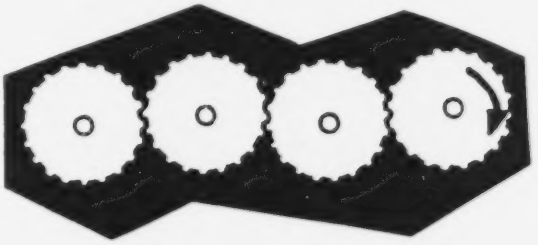
Area = ___ Area = ____ Area = ____

★ 2. Look at the gears below. The one on the right end is turning clockwise. As it does, it turns the one next to it, and this continues down the line. In which direction does the gear on the far left turn?

Bubble-in your answer:

⬭ Clockwise.

⬭ Counterclockwise.



★★★★ 3. Suppose for a moment that you had a whole bunch of gears lined up, as shown in the picture above. Answer the questions below:

In which direction would the 5th from the right end turn? _____
In which direction would the 6th from the right end turn? _____
In which direction would the 10th from the right end turn? _____
In which direction would the 96th from the right end turn? _____

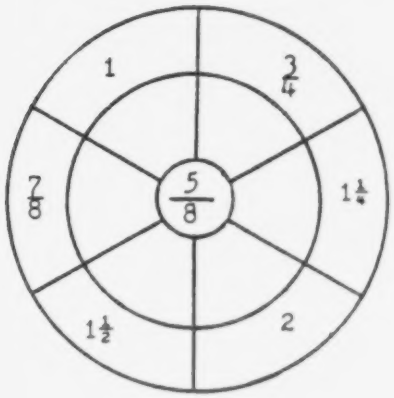
★★★ 4. Farmer Brown had some animals. ¼ were horses and ½ were cows, and the rest were pigs. He had 8 pigs. How many horses and cows did he have?

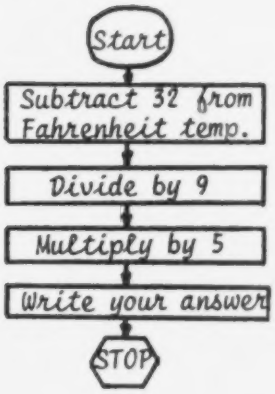
Answer: He had ____ horses and ___ cows.

★ 5. Janice bought 6 stickers, and paid $1.25 for them. About how much did each sticker cost? (Bubble-in the best estimate.)

- ○ $0.06
- ○ $0.25
- ○ $0.20
- ○ $0.21

★★ 6. Put the missing fractions in the center part of this wheel. When added to 5/8, the sum should be the number in the outside of the wheel.





★★ 7. To the left is a flowchart that shows how to change a Fahrenheit temperature to a Celsius temperature. Use the flowchart to change these values:

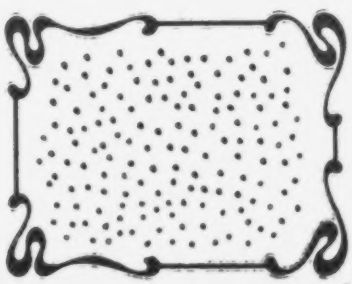
FAHRENHEIT	CELSIUS
59	☐
86	☐
122	☐

★★★ 8. William used the flowchart above, and got a Celsius temperature of 60°. What was the Fahrenheit temperature he started with?

Answer: ___° F

★ 9. Count the dots:

Answer: ___



STAR PROBLEMS
GRADE 4 XIV

I have neither given nor received help on these problems:_____

★★ 1.

(1 x 9) + 2 = 11
(12 x 9) + 3 = 111
(123 x 9) + 4 = 1111
(1234 x 9) + 5 =

Will you always get ones in your answer if you continue this pattern?_____

Try: (12345678 x 9) + 9 = [ ]

★★ 2. What is the closest estimated answer to this problem? Circle your choice.

43
+8
49

a. 12,000
b. 13,000
c. 14,000

★ 3. Write P beside each prime number and C beside each composite number.

a) 2 dozen eggs_____

b) the difference between a dime and a nickel_____

c) the number of inches in 1½ feet_____

d) the number of months with 31 days _____

★★★ 4. On March 14 the lowest temperature in the U.S. was 0° Celsius and the highest temperature was 95° Fahrenheit. The difference between the two temperatures was _____°F.

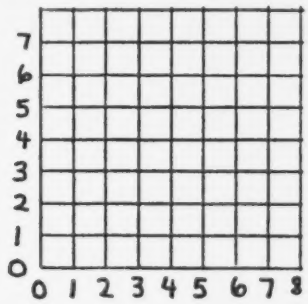
★ 5. Fill in the missing numbers in this pattern:

. . . . 75 ____ 63 57 51 ___ 39 ___ 27 21 15 9 3

★★ 6. Discover the pattern and complete the table:

2	2/3		
1	1/3	1/9	
1/2	1/6	1/18	

★★ 7. Find these points on the graph below, and connect them in the order given. Then connect the last point given, to the first one.



Connect:

(5,7) to (7,4) to (5,1) to (3,4)

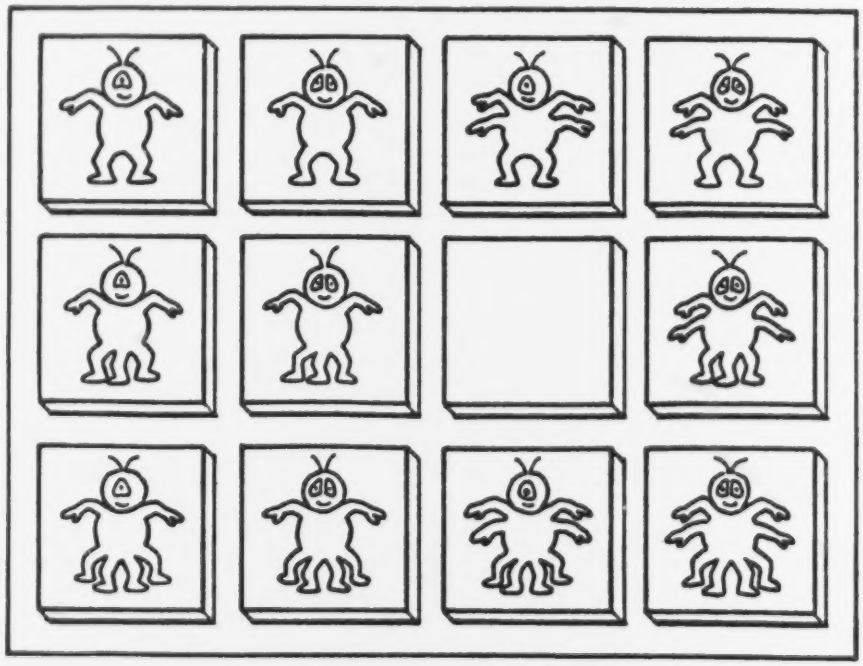
Then connect (3,4) to (5,7).

8. Pretend that your family is planning a vacation, but you can't decide when is the best time of the year to go. So you decide to put the name of the 12 months into a bag, and draw one out without looking.

★★ (a) What is the probability, expressed as a fraction, that you'll pick a month with at least 30 days? Answer: ☐

★ (b) What is the probability, as a fraction, that you won't pick a month that begins with "J"? Answer: ☐

★★★ 9. Francis Lettieri made some space creatures called ZORKIES--eleven of the twelve creatures are shown below. Draw in the one that's missing, by noticing the patterns.



Star Problems
Grade 4, XV

I have neither given nor received help on these problems: _____

★★★★ 1. For homework, you are to read a two-page story in a book of short stories. The product of the page numbers is 240. What pages are you to read? (*Hint: the pages are consecutive, as in 4, 5*)

Answer: The pages I am to read are page __ and page __.

★★ 2. What whole number is closest to the sum of these mixed numbers?

$$1\frac{1}{99} + 3\frac{34}{35} + 5\frac{2}{93} + 7\frac{88}{90}$$

Circle your answer: 16 18 20 24

★★★ 3. An unusual way to multiply is called "doubling and halving." You would do a problem like 37 x 24 this way:

1st step:
Start halving the first number, and doubling the second, till you get to 1 in the "halving column."

HALF	DOUBLE
37	24
18 r1	48
9	96
4 r 1	192
2	384
1	768

2nd step:
Cross out even numbers in the halving column, and their partners in the doubling column:

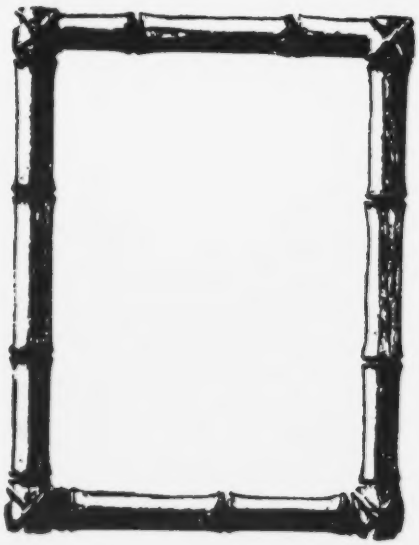
HALF	DOUBLE
37	24
~~18 r1~~	~~48~~
9	96
~~4 r1~~	~~192~~
~~2~~	~~384~~
1	768

3rd step:
Add the numbers left in the double column, and you'll have the answer to 37 x 24.

To show you understand this way to multiply, list the numbers you would add for step 3 above, and their sum.

Answer: I would add ___, ___, and ___. Their sum is _____, which is the answer to 37 x 24.

★★★ 4. Use *doubling and halving* to multiply 36 by 41. Put your work in the box to the right, showing how you mark out numbers, and add what's left, to get the answer.



★ 5. Look at the frame to the right very carefully. According to the way the frame looks, where is the light coming from? Circle your answer:

upper left *upper right*
lower left *lower right*

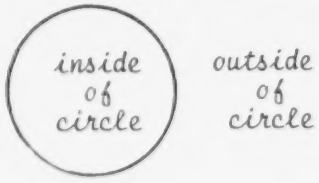
★★★ 6. Tim's first five grades are 90, 84, 86, 97, and 85. If he has an average of 90, he'll get an A. Will Tim get an A, or must he settle for a B?

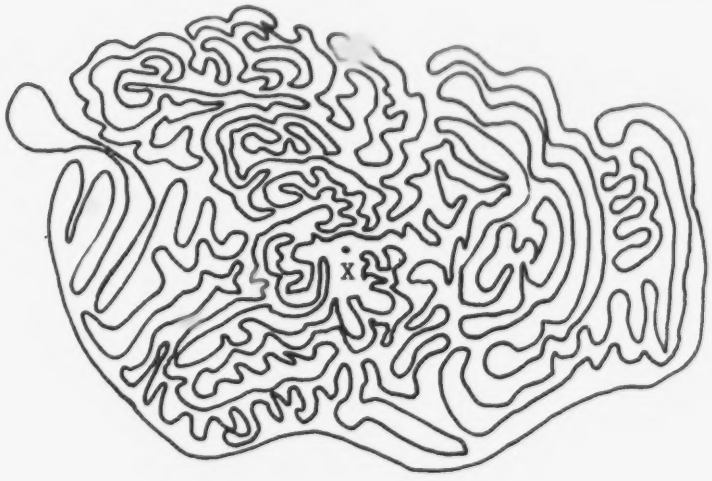
Answer: Tim will get a(n)__.

★ 7. The curve below used to be a circle, till it got pushed and pulled out of shape. But it's still like a circle in that it has an inside and an outside. Is point X on the inside, or the outside, of the curve?

Bubble in your answer:

⬭ inside
⬭ outside



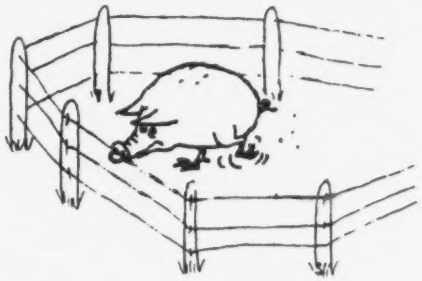


STAR PROBLEMS
GRADE 4 XVI

I have neither given nor received help on these problems._____

★★★ 1. A farmer had 13 pigs and 27 chickens. How many legs were there on the 40 animals?

ANSWER:_____

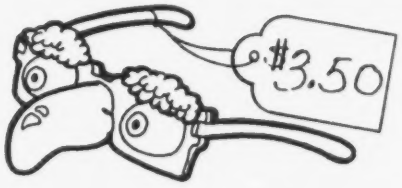


★ 2. Find the missing digits.

$$\begin{array}{r} 5\_,\,6\,8\,2 \\ -\;4\,3,\,8\_\,6 \\ \hline 6,\,7\,8\,6 \end{array}$$

★★ 3. Sale: ½ off the marked price. How much will the funny glasses cost?

ANSWER: _____



★ 4. Put in <, >, or =: 1/4 + 1/4 ◯ 3/4

★★★★ 5. □ *is covering up an even number.* ⬡ *is covering up an odd number.*

△ *is covering up an even number.* ○ *is covering up an odd number.*

Write "even" or "odd" for each problem below, to show what type of number the answer would be.

A. □ + △ *is an* _____ *number.*

B. □ - △ *is an* _____ *number.*

C. □ x △ *is an* _____ *number.*

D. ⬡ + ○ *is an* _____ *number.*

E. ⬡ - ○ *is an* _____ *number.*

F. ⬡ x ○ *is an* _____ *number.*

★ 6. Use the graph below to answer the following questions.

A. How many more people are going to New York than to Los Angeles?

Answer: _____

B. How many more went to Chicago than to Ft. Worth?

Answer:_____

People Flying To Four Cities

Each stands for 50 people

New York	
Chicago	
Fort Worth	
Los Angeles	

★ 7. According to the Guinness Book of World Records, the oldest woman in history lived 113 years and 214 days. How many more days did she need to live to reach her 114th birthday?

ANSWER:_____

★ 8. The weight of a banana would be measured in _____.

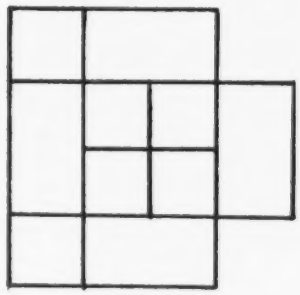
Circle the correct word that makes the statement true.

A. celsius B. meters C. liters D. grams

STAR PROBLEMS
Grade 4, XVII

I have neither given nor received help on these problems. _____

★★ 1. There are 13 different squares in this picture. Trace each different-size square. How many of each size are there?



Answer: _____ small squares

_____ medium squares

_____ large squares

★★ 2. Henry bought a shirt for $12.95, a belt for $5.00, and a pair of jeans for $15.98. The tax at 5% is $1.70. How much change did he receive if he gave the clerk 3 ten dollar bills and 2 five dollar bills?

Answer_____

★★ 3. Round off each amount to the nearest dime.

$ .36 _____ $ .20 _____ $ .41 _____

$ .58 _____ $ .24 _____ $ .79 _____

★★ 4. Arrange the following fractions in order from smallest to largest. (Hint: use the drawing to help you.)

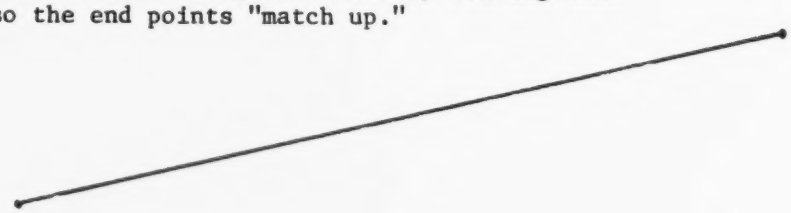
1/2, 1/3, 2/3, 1/4 Answer _____

★★★ 5. What two whole numbers could replace "X" so both of these statements will be true?

Statement 1: $6+X > 7$
Statement 2: $6+X < 10$

Answer: "X" could be either __ or __.

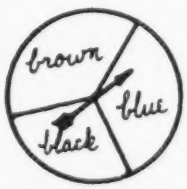
★ 6. Bisect (cut in half) the line segment below by folding this sheet of paper so the end points "match up."



★★★ 7. A tiger escaped from the zoo at 3:20 P.M. It was found 4 hours and 45 minutes later. At what time was the tiger found?

Answer _____

★ 8. What fraction tells the chance that the spinner will land on brown after one spin?



Answer _____

★★ 9. What fraction tells the chance that the spinner above will <u>not</u> land on brown?

Answer: _____

STAR PROBLEMS
Grade 4, XVIII

I have neither given nor received help on these problems:_____

★★ 1.

I am a three-digit number.
I am less than 200.
I am divisible by 12 and 9.
My units digit is less than my tens digit.

What number am I?

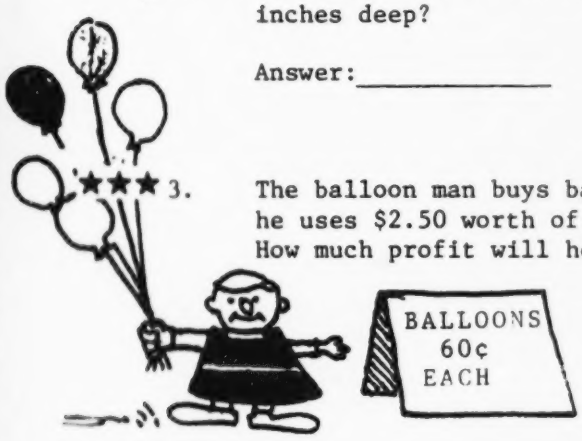
Answer:_____

Divisible by means: "Can be divided by with no remainder."

Example:
81 is divisible by 3 because
81 ÷ 3 = 27

★ 2. How much dirt is there in a hole 3½ feet by 4½ feet wide, and 24 inches deep?

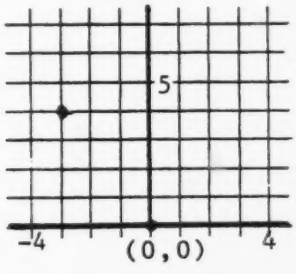
Answer:_____



★★★ 3. The balloon man buys balloons for 7¢ each. To inflate 100 balloons he uses $2.50 worth of helium and two balls of string costing 60¢ each. How much profit will he make if he sells 100 balloons?

Answer:_____

★★ 4. On a graph like the one below, points are located by first going either *left* or *right*, and then *up*. An ordered pair of numbers, like (-3, 4) tells you exactly where to find the point. (-3, 4) is shown for you below.

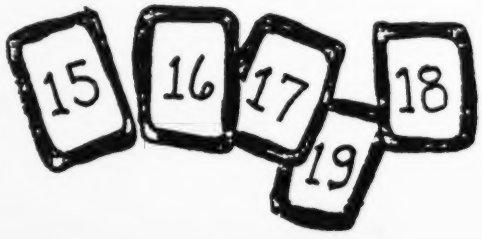


For your 2 stars, mark these points and connect them in order.

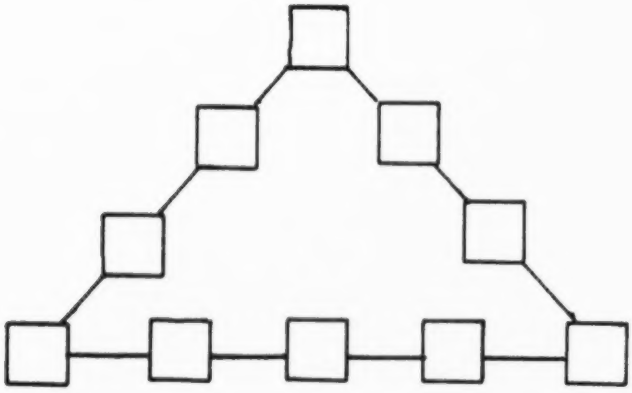
a. (-3,4)	f. (1, 3)
b. (-1,3)	g. (3, 4)
c. (-2,0)	h. (1, 4)
d. (0, 2)	i. (0, 7)
e. (2, 0)	j. (-1,4)
	k. (-3,4)

★★ 5. Make the cards shown to the right. Then shuffle the cards and turn them face down. What is the probability you will not draw an even number on your first draw?

Answer: ___

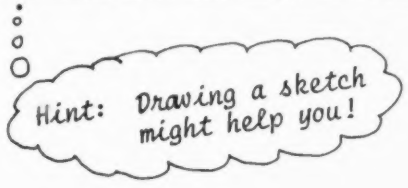


★★★★ 6. **Place the numerals 0-9 on this triangle so that the sum of each side of the triangle is equal.**



★★★ 7. **Four animals had a race, running at different speeds. They started from the same spot but at different times. Use the information below to complete the chart for first, second, third and fourth place.**

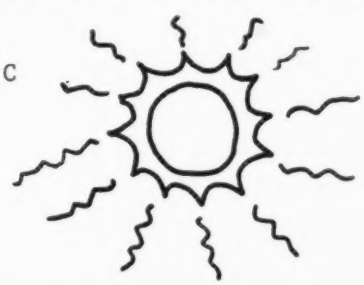
ANIMAL	SPEED (Miles per hour)	DEPARTURE	PLACE AT NOON
CHICKEN	9 MPH	8:00 AM	?
ELEPHANT	25 MPH	10:00 AM	?
LION	50 MPH	10:30 AM	?
COW	11 MPH	9:00 AM	?



★ 8. **On the Fourth of July, a typical temperature in Florida during the day would be:**

a. 12°C b. 120°F c. 36°C

Answer:_____



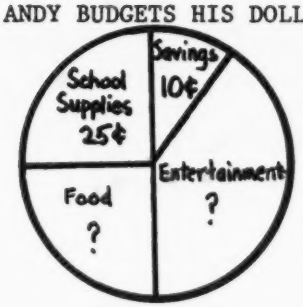
STAR PROBLEMS
Grade 4, XIX

I have neither given nor received help on these problems: _____

★ 1. Find a pair of numbers for each sum and product. Write your answers in the ☐ 's.

	NUMBERS	SUM	PRODUCT
Example:	5 , 3	8	15
	☐ , ☐	9	14
	☐ , ☐	9	18
	☐ , ☐	12	27
	☐ , ☐	10	16
	☐ , ☐	8	7

ANDY BUDGETS HIS DOLLAR



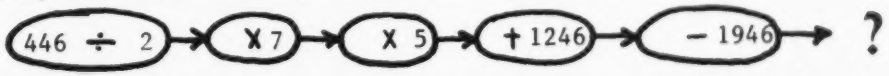
★ 2. How much of his $1.00 did Andy spend on food?

Food _____

★ 3. How much of his $1.00 did he spend on entertainment?

Entertainment _____

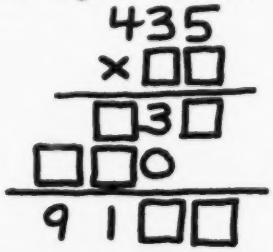
★★ 4. Complete the following operations on your calculator.



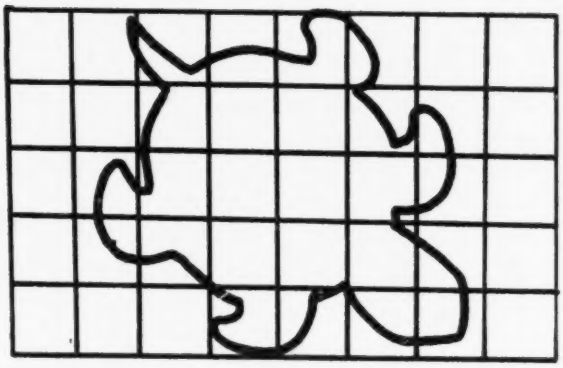
Now turn your calculator upside down. What word is displayed on your calculator?

Answer: _____

★★ 5. Fill in the digits that are missing below.

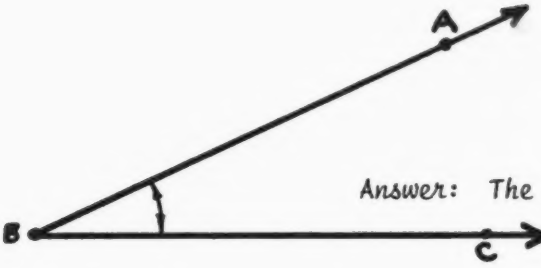


★★ 6. About what is the area of the turtle? Circle the closest choice below.



a. about 10 cm^2
b. about 16 cm^2
c. about 21 cm^2
d. about 24 cm^2

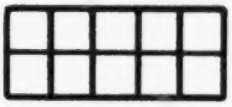
★★★ 7. Use a protractor to measure ∠ ABC.

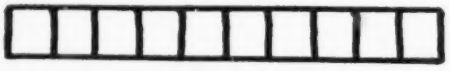


Answer: The angle is ___ degrees.

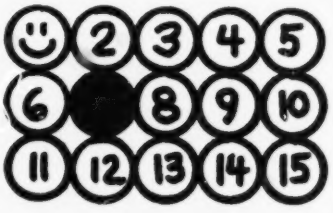
★★ 8. 7 is a <u>prime</u> number. If you had 7 squares of paper, there is only one way to make a rectangle.

10 is a <u>composite</u> number. If you had 10 squares of paper, you would be able to make a rectangle in more than one way.





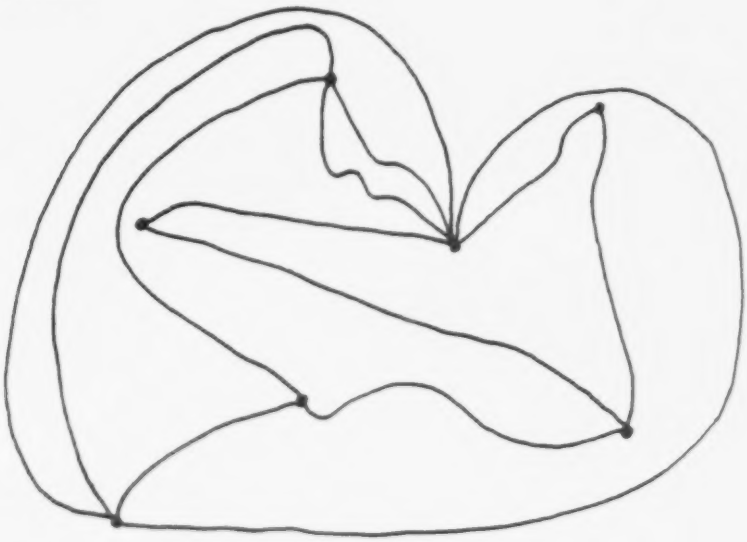
Investigate these numbers. Color in the <u>prime</u> numbers.



Star Problems
Grade 4, XX

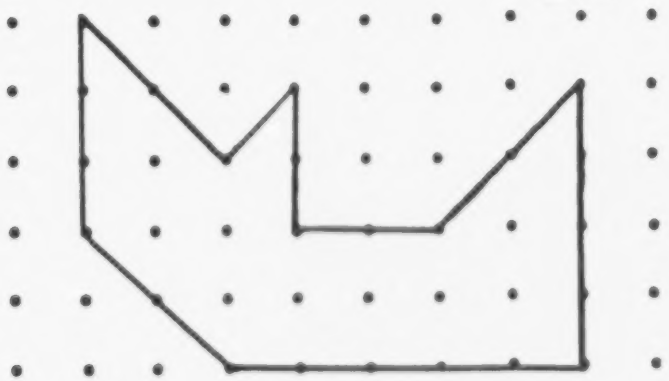
I have neither given nor received help on these problems_____

★★ 1. You can trace over the figure below with a pencil without retracing any path, if you start in the right place. Find the 2 places where you can start and do this, and draw circles around them.



★ 2. Find the area of the figure below. The area of a figure is the number of unit squares it would take to cover it up.

A unit square looks like this:



Answer: Area= _____

★★★ 3. Two cars started on a trip at 6:00 a.m. By 8:00 a.m. car A was 35 kilometers ahead of car B. By 8:30 a.m. car B had traveled 50 more kilometers. Car A had traveled 45 more kilometers by 8:30 a.m. How far apart were the two cars at 8:30 a.m.?

Answer: _____

★★ 4. Mary needed some magazine pictures for a social studies project. She cut out pages 20, 21, 97, 98, and 104. How many sheets of paper did she cut from the magazine?

Answer: She cut out ___ sheets of paper.

★★ 5. Meg A. Bucks went to a jewelry store to beef up her collection of fabulous gems. She bought two necklaces for $2,500 each. She also bought a stunning bracelet for $7,500 and two pairs of earrings at a mere $800 per pair. She estimated quickly and wrote out a check for $13,000, telling the clerk to keep the change. Use your calculator to determine whether the clerk:

a) used the change to go to Hawaii.
b) used the change to have lunch at McDonald's.
c) made Meg tear up her check and write a new one.

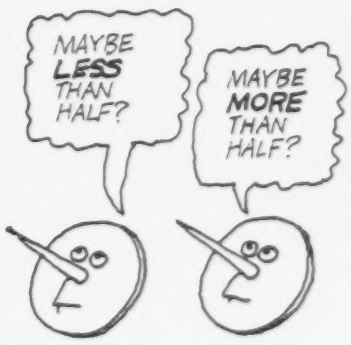
Answer: _____

★★★ 6. The Jolly Green Giant has not always been 9 feet tall. He was only 2 feet tall at birth. Make a line graph to show his growth at the ages given.

Birth - 2 feet
5 years - 5½ feet
10 years - 7 feet
15 years - 8 feet
20 years - 8½ feet
25 years - 9 feet

LINE GRAPH:

★★★★ 7. Toss a thumbtack 25 times and record the outcomes on the chart.



Experiment: Tossing a Thumbtack		
Possible outcomes	point down	point up
Tally of outcomes		
Fraction of all outcomes		

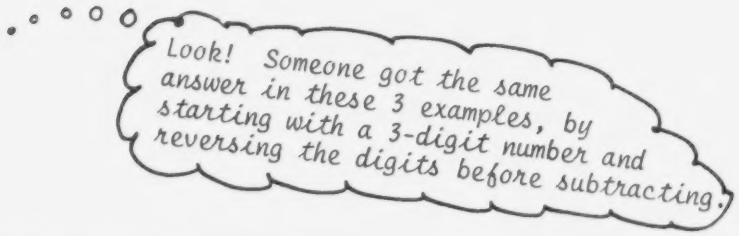
If you were to toss the thumbtack only once, which outcome has the greatest chance of occurring? _____

STAR PROBLEMS
Grade 4, XXI

I have neither given nor received help on these problems: _____

★★ 1.

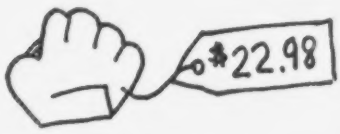
631	452	512
- 136	- 254	- 215
495	198	297
+ 594	+ 891	+ 792
1089	1089	1089


Look! Someone got the same answer in these 3 examples, by starting with a 3-digit number and reversing the digits before subtracting.

Find another example that will work like the ones above.

Answer:

★★ 2. What is the total cost of the following items?



Sale price! $\frac{1}{3}$ off the price on the tag.

Sale price! $\frac{1}{4}$ off the price on the tag.

Answer: The cost of the glove and space game, before tax is added, would be _____.

★★ 3. The sum of $13\frac{49}{50}$ and $16\frac{1}{49}$ is about

a. 29
b. 30
c. 31
d. 32

★ 4. Put >, <, or = between each set of numbers.

a. $3 \times 17 \square 82 \div 2$

b. $\frac{1}{13} + \frac{1}{13} + \frac{2}{13} \square \frac{7}{13} - \frac{3}{13}$

c. $231 - 19 \square 354 - 79$

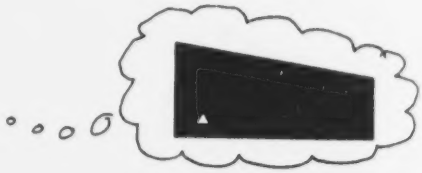
d. $54 \times 12 \square 20 \times 36$

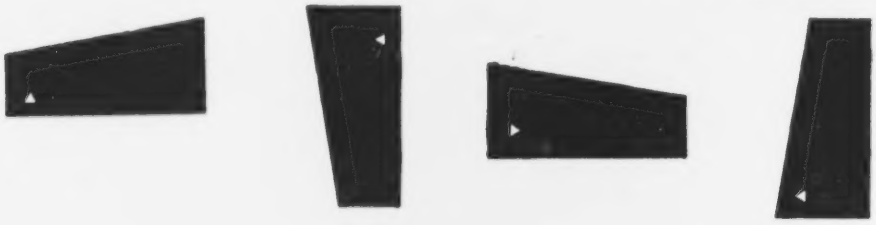
★★★★ 5. Solve for χ in each of the problems below:

(a) $23 - \chi = 14$; $\chi =$ __ (c) $14 \times \chi = 140$; $\chi =$ __

(b) $\chi + 53 = 79$; $\chi =$ __ (d) $88 \div \chi = 8$; $\chi =$ __

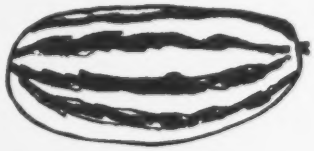
★★ 6. Circle the one drawing below that can be turned over or rotated, or both, to look like the drawing to the right.





★★ 7. The largest watermelon grown weighed 197 pounds. The largest pineapple grown weighed 16 pounds, 11 ounces. What is the difference in weight between the watermelon and the pineapple?

Answer: _____



★★ 8. Use a calculator to compute: $\left[(368 \times 48) + (246 \times 31)\right] \div 5 = ?$

Answer: _____

★★★ 9. Joe cut a log into 2 pieces in 10 minutes. At that rate, how long will it take him to cut another such log into 3 pieces?

Answer: ___ minutes

★★ 10. If today is Wednesday, what day of the week was 6 days before the day after tomorrow?

Answer: _____

STAR PROBLEMS
Grade 4, XXII

I have neither given nor received help on these problems:_____

★★ 1. How many eggs would Jane's dad have left if he bought ½ dozen to start with, and then used 1/3 of them for lunch?

Answer:_____eggs left

★★ 2. Use the chart below to solve this problem: A red house, a white house, a yellow house, and a blue house are all in a row.

A. The blue house is not first.
B. The white house is between the red house and the yellow house.
C. The red house is between the blue house and the white house.

What is the position of each house?

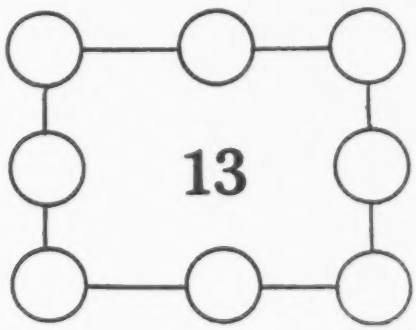
	1st	2nd	3rd	4th
RED				
WHITE				
YELLOW				
BLUE				

Answer: _____ is 1st.
_____ is 2nd.
_____ is 3rd.
_____ is 4th.

★ 3. Jeff has to be finished with his science project in two weeks. It is now March 13th. What is the date that the science project is due? If he is given a five day extension, what will that date be?

Answer: Due date?_____ Date after extension?_____

★★★ 4. In the figure below, the number in the center is the sum of the numbers on each of the four sides. Fill in the numbers which go in the circles. You can use any of the digits 0-9, but each only once.

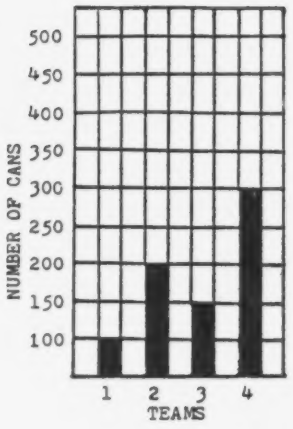


★★★★ 5. Rename these BASE TWO numerals as BASE TEN numerals:

101_{two} = ____ 1001_{two} = ____

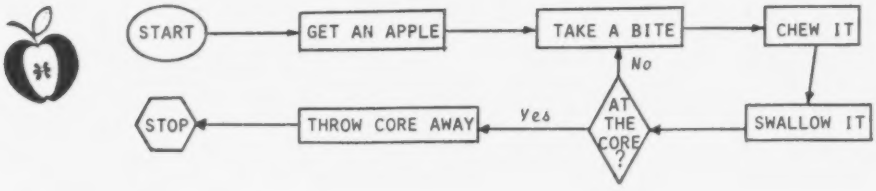
11_{two} = ____ 1101_{two} = ____

★★★ 6. A class of fourth graders was divided into 4 teams to collect aluminum cans. The class goal was to collect 1000 cans. From the graph find out how many more cans they need to collect to reach their goal.



Answer: _____ cans

★★★ 7. The flowchart below shows how to eat an apple:



Change the flowchart above by adding a step "MARK 1 MORE" so that, as you eat the apple, you automatically keep up with how many bites you take. Then eat an apple according to the flowchart, and find out how many bites it really does take!

Answer: It took me ____ bites.

Flowchart:

★ 8. When you turn in your paper, you will be given a problem like the one below. You'll have to do it completely in your head to get your star, so practice a few like this at home.

Answer later on: ☐

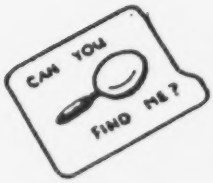
Mike needed to buy 4 packages of pencils at 18¢ each and 2 packages of paper at 59¢ each. He has $2.00 and also wants to buy an eraser for 19¢. Does he have enough money to buy the eraser? (You must use estimation and only write your answer.)

Answer_____

STAR PROBLEMS
Grade 4, XXIII

I have neither given nor received help on these problems._____

★★ 1.



I am a two-digit number.
I am an even number.
I am a multiple of seven.
The sum of my two digits is divisible by seven.

What number am I?

Answer: _____

Divisible by means: "can be evenly divided by with no remainder".

Example: 39 is divisible by 3 because:

39 ÷ 3 = 13

★★ 2. Multiply the digits in your answer to #1. Is the product an even number or an odd number?

Answer: _____number

★★ 3. Henry bought a shirt for $12.95, a belt for $5.00, and a pair of jeans for $15.98. The tax was $1.36. How much change did he receive if he gave the clerk 3 ten dollar bills and 2 five dollar bills?

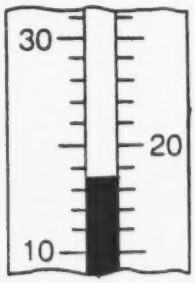
Answer: _____

★ 4. Estimate the cost of each group of purchases below. Which group has a total closest to $5.00?

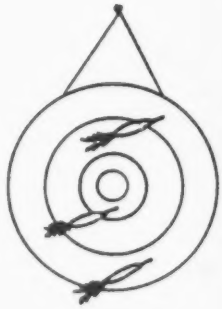
a) 3 packages of flower seeds, 3 bags of soil, 3 flowerpots
b) 3 packages of flower seeds, 2 bags of soil, 3 flowerpots
c) 4 packages of flower seeds, 2 bags of soil, 4 flowerpots
d) 5 packages of flower seeds, 1 bag of soil, 4 flowerpots

Answer: _____

★★ 5. The thermometer below shows the temperature in New York at noon on January 15, 1984. By midnight it had dropped 23° lower than it was at noon. What was the temperature at midnight?



Answer: _____

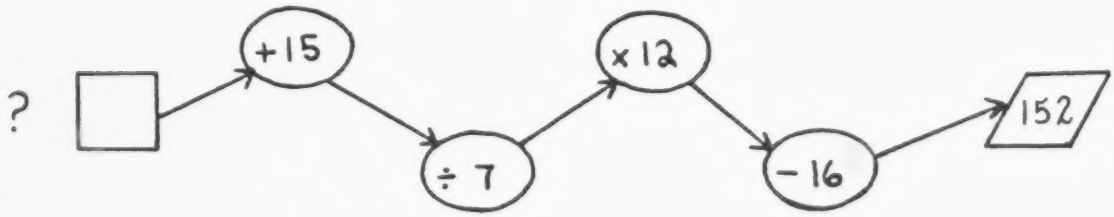


★★★ 6. Sue and Bill were playing darts. Sue scored 40, 45, 49, and 46 on her throws. Bill scored 39, 43, 44, and 46 on his throws. How much higher was Sue's average score, than Bill's average score?

Answer: ___ points higher

★★ 7. If you begin with a certain two-digit number and follow the arrows, you will end with the number 152 shown in the ▱.

Write the starting number in the □.



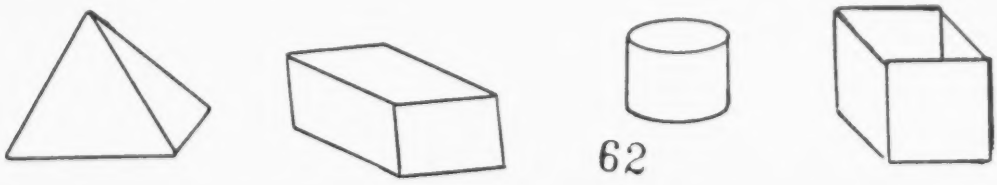
★★★ 8. In these addends, each letter represents a distinct digit. Find the numbers.

```
  C E N T
  C E N T
+ S C E N T
  3 5 1 2 8
```

Answer:

3 5 1 2 8

★ 9. Draw a circle around the figure below that is not a *polyhedron*.



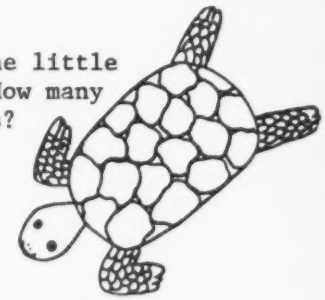
Star Problems
Grade 4, XXIV

I have neither given nor received help on these problems: _____

★★★ 1. Jane bought a sweater for her Mom for Christmas for $24.99, a coat for her Dad for $37,88, and a watch for her brother for $16.00. The sales tax was $3.15, and she paid with 5 twenty-dollar bills. How much change should she get?

Answer: _____

★ 2. A female loggerhead turtle lays 100 eggs in a sandy nest. The little turtles hatch in 2 months and head straight for the water. How many female turtles would be needed to hatch out 1000 baby turtles?

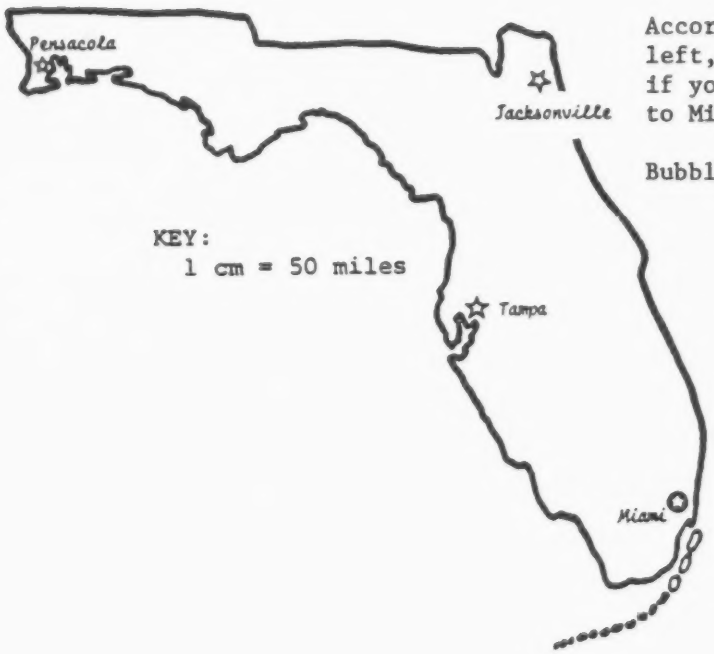


Answer: _____

★★ 3. Jane earned $2.25 each week for helping at home. How much had she earned at the end of 4 weeks?

Answer: _____

★★ 4.



According to the map to the left, how far would you drive if you went from Jacksonville to Miami?

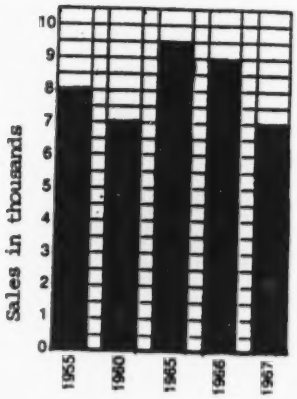
Bubble in your answer:

- About 200 miles ○
- About 300 miles ○
- About 400 miles ○
- About 500 miles ○

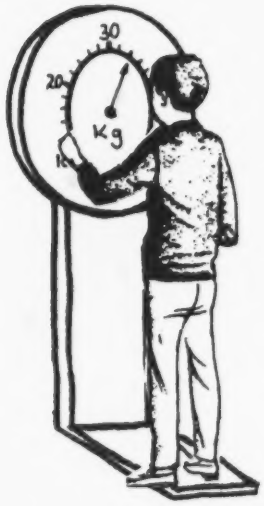
★★ 5. Do this problem without writing below the line.

$7\overline{)6\,3\,7\,6\,3\,7\,6\,3\,7\,0}$

★★ 6. Use the bar graph to find the increase in sales from 1955 to 1965.



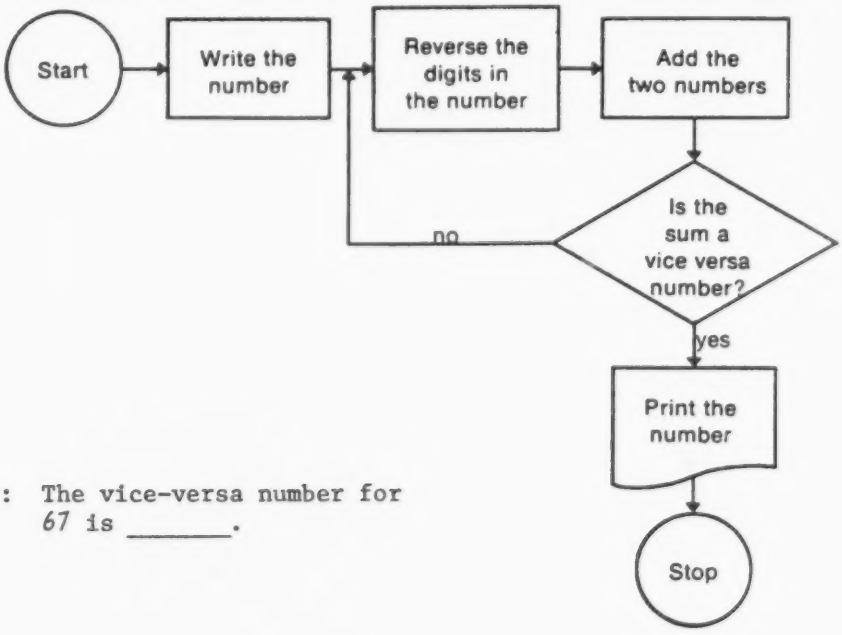
Answer: $_____



7. Sam weighed himself at the doctor's office. How much did Sam weigh?

Answer: Sam weighed _____ kg.

★★★ 8. Vice-versa numbers read the same forwards and backwards, as in 54845. This flowchart tells how to turn a number that is not a vice-versa number, into one by addition. Use the number *67* to complete the flowchart.



Answer: The vice-versa number for *67* is _____.

★★★ 9. The vice-versa number for 75 is 363. To find this number using the flow chart, you have to "go through the loop" ____ times.

Star Problems
Grade 4, XXV

I have neither given nor received help on these problems: _____

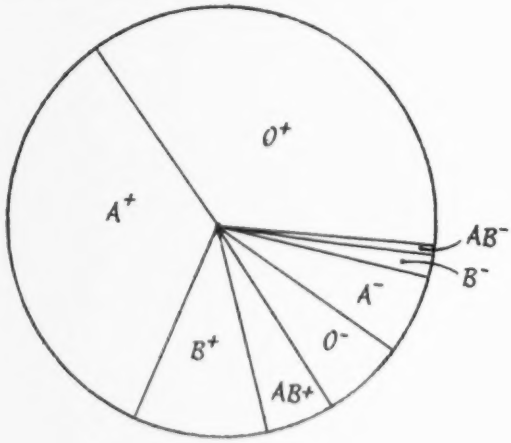
★★★ 1. Everybody in the world has one of the 8 blood types shown in the circle graph below. The size of the region gives you an idea of the percentage of people in the world with that particular type of blood. O^+ (read "oh positive") occurs more often than any of the other blood types--36% of the people in the world have O^+ blood.

Answer these questions:

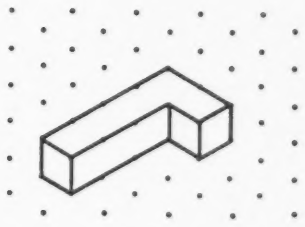
(a) About what percentage have A^+ blood? ☐

(b) What is the most rare blood type? ☐

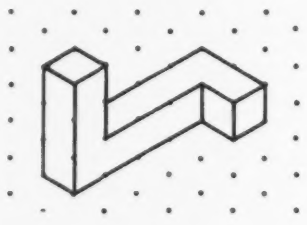
(c) Are there more people with AB^+ or with O^-? ☐



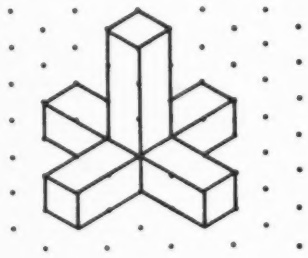
★★ 2. Each of the solids below is made from cubes that look like
Write the number of cubes it takes to build each one.



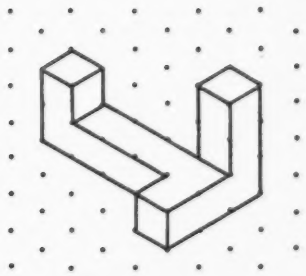
Number of cubes _____



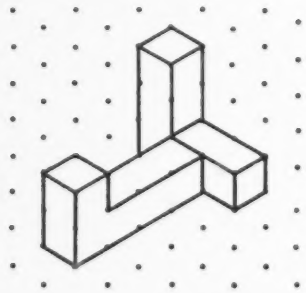
Number of cubes _____



Number of cubes _____



Number of cubes _____



Number of cubes _____

★★★ 3. The *greatest common factor* of two numbers is the largest number that divides both of them, with no remainder. The *greatest common factor* is quite useful when you "reduce a fraction to lowest terms." Find the greatest common factor for each pair of numbers below.

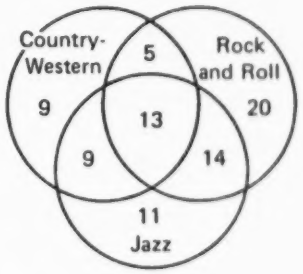
NUMBER PAIR	GREATEST COMMON FACTOR
15 and 10	____
45 and 63	____
50 and 40	____
33 and 44	____
100 and 80	____

★★★ 4. Lakeside Elementary School took a poll of its fourth graders, to find out how many students liked Jazz, Country-Western, or Rock and Roll music. The results are shown in the circle drawing below:

(a) 36 students liked Country-Western music. How many liked Jazz? ☐

(b) How many students liked both Jazz and Rock and Roll? ☐

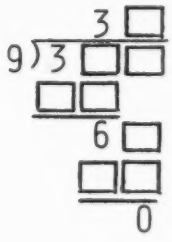
(c) How many students liked all three types of music? ☐



★ 5. Karen has three apples in a paper bag. How can she give one apple to each of three friends, and still leave one apple in the paper bag?

Answer: _____

★★ 6. Fill in the missing numbers in this problem.



Star Problems
Grade 4, XXVI

I have neither given nor received help on these problems: _____

★★★★ 1. Solve for X in the problems below.

(a) X x 24 = 192; X = ☐

(b) X ÷ 7 = 224; X = ☐

(c) 175 ÷ X = 35; X = ☐

(d) 16 x X = 144; X = ☐

★★★ 2. Three tired and hungry men had a bag of apples. When they were asleep, one of them awoke and ate 1/3 of them. Later, a second man awoke and ate 1/3 of what was left. Finally the last man woke up, and ate 1/3 of what was then in the bag. Eight apples were left after all that.

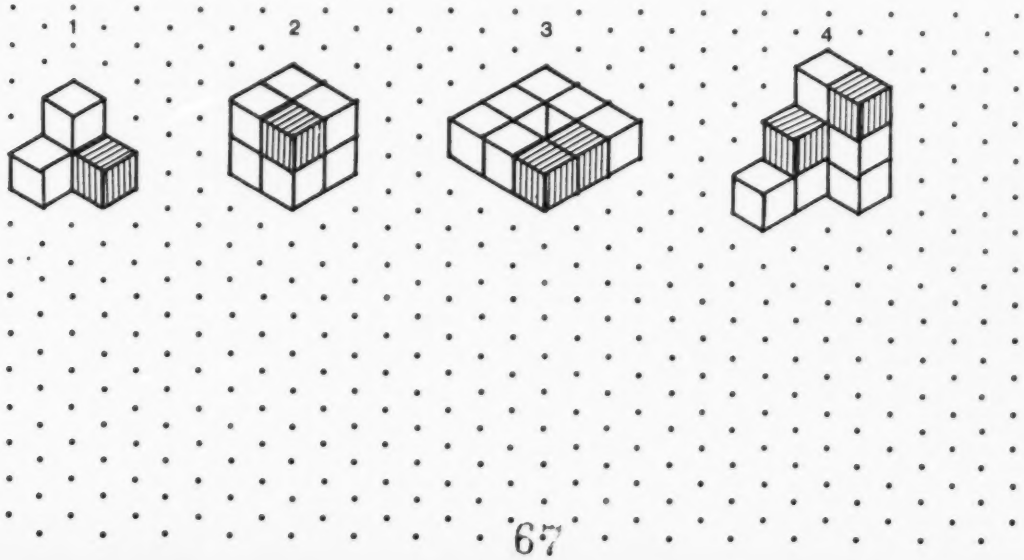
How many apples were in the bag to start with? ☐

★★ 3. Solve these problems on your calculator. Remember to do what is inside the parenthesis first--you can store these numbers in your calculator's memory unit, if it has one, adding or subtracting as you go.

(a) (23x14) + (31x6) - (9x17) = _____

(b) (322 ÷ 7) + (342 ÷ 9) - (18x4) = _____

★★★★ 4. The drawings below show figures made from cubes. Take away the shaded cube or cubes, and draw what remains below the figure.



★ 5. About how long is it around the outside edge of an ordinary door in your house? Bubble-in the best answer below.

○ 8 meters ○ 6 meters ○ 4 meters ○ 2 meters

★★★ 6. Use the chart below these clues to help you find out who owns which car. Lisa, Ron, and Karen own a bicycle, a car, and a motorcycle, but not necessarily in that order.

CLUES:

A. THE CAR OWNER OFTEN BEATS KAREN AT TENNIS.

B. KAREN IS THE SISTER-IN-LAW OF THE BICYCLE OWNER.

C. RON HAS TWO MORE CHILDREN THAN THE CAR OWNER.

Chart to use:

	bicycle	*car*	*motorcycle*
Ron			
Lisa			
Karen			

Answer: Lisa owns the _____, Ron owns the _____, and Karen owns the _____.

★ 7. What fraction of the square to the right is not shaded?

Answer:

★★ 8. Put the same digit in each box, to get the answer shown:

$$\square\square\square \times \square = 7104$$

★★ 9. Practice doing some long division problems like the one to the right, without writing any numbers below the dividend. You'll be given a problem like this when you hand in your paper--you'll have to do it this way to get your stars.

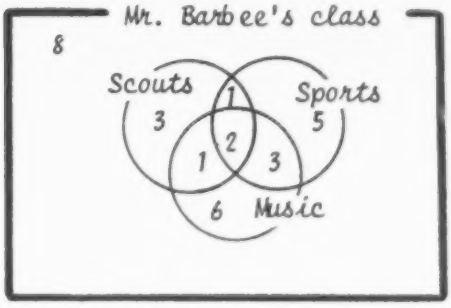
$6\overline{)3780234615}$

Answer later on: _____

Star Problems
Grade 4, XXVII

I have neither given nor received help on these problems: _____

★★ 1. Mr. Barbee's fourth grade class took a survey to find out what the kids did in the afternoons after school. They made a circle diagram of the results. Answer the questions to the right of the diagram.



(a) How many students were in scouts? ☐

(b) How many students took music lessons? ☐

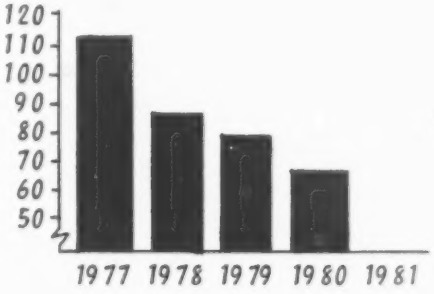
(c) How many students play a sport? ☐

(d) How many students are in scouts, take music lessons, and play a sport? ☐

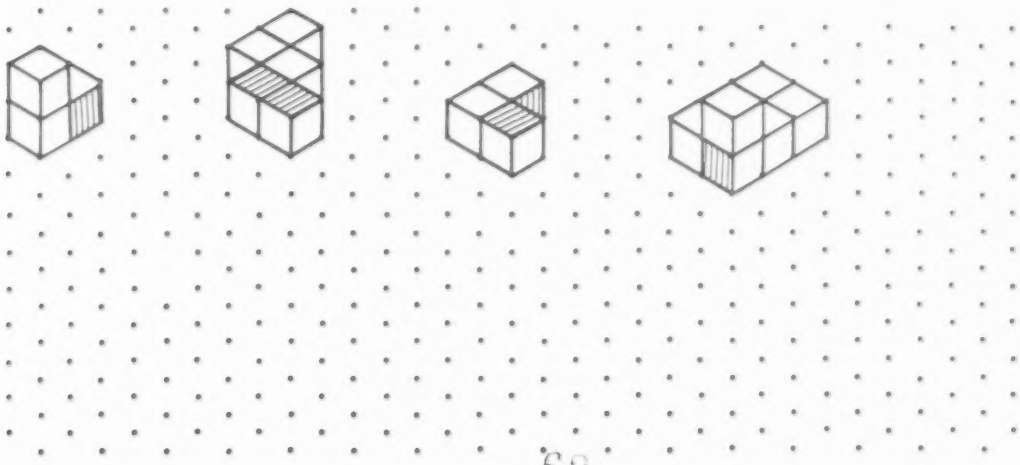
(e) How many students did none of the three after-school activities? ☐

★ 2. In 1977, Florida started keeping good records on the number of Manatees that died during the year. The results through 1980 are shown in the bar graph. Assuming the same trend carried through to 1981, what was the total number of deaths that year?

For your answer, draw in the bar above 1981.



★★★★ 3. Each solid figure below is made from cubes. Add a cube to each shaded face, and draw what the new solid looks like below each figure.



★★★ 4. **Brown, Larkens, and Smith are the treasurer, manager, and teller of a bank, although not necessarily in that order. Which person has which position? Use the chart to help you.**

Clues:

1. Smith earns more money than the manager.
2. The teller earns the least.
3. Smith married Brown's sister, and the teller is an only child.

Chart:

	Treasurer	Manager	Teller
Smith			
Larkens			
Brown			

Answer: Smith is the _____, Larkens is the _____, and Brown is the _____.

★★★ 5. The stamp to the right measures 3 centimeters by 2 centimeters. Check it with a ruler just to be sure.

Stamps like this come in big sheets that have 8 rows, with 5 stamps in each row. What would the *perimeter* be, for such a large sheet of stamps? _____ cm What would the *area* be, for the large sheet of stamps? _____ cm^2

★★★★ 6. Find a calculator that will add the same number over-and-over again, just by pressing [=] . Test it out by doing: [3] [+] [3] [=] [=] [=] [=] . If you get 15, you have such a calculator.

If the [x] key is broken on your calculator, you can use the [=] key over-and-over to multiply numbers.

Examples: (1) *To multiply 5x14 without using* [x] , *press* [1] [4] [+] [1] [4] [=] [=] [=] [=] . *You'll get 70.*

(2) *To multiply 10x11 without using* [x] , *press* [1] [1] [+] [1] [1] [=] [=] [=] [=] [=] [=] [=] [=] [=] . *You'll get 110.*

Practice multiplying this way on your calculator at home, on the problems below. (You can check to see if you're right by using [x] .) When you turn in your paper, you'll be given a problem like these and a calculator, and you will have to find the answer using [=] over-and-over, instead of [x] .

Practice problems:

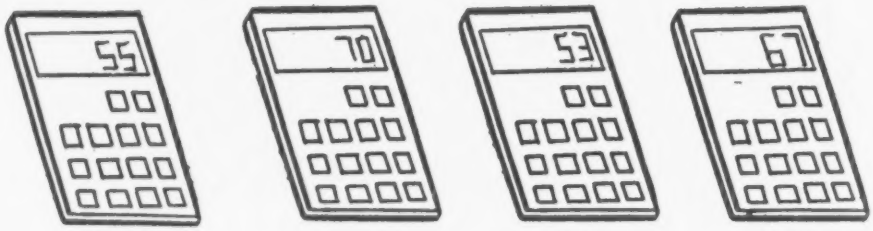
(a) 9 x 15	(d) 6 x 14	(g) 10 x 14
(b) 12 x 17	(e) 7 x 32	(h) 6 x 18
(c) 8 x 21	(f) 13 x 9	(i) 12 x 13

Answer for the problem when you turn in your paper: [ ]

Star Problems
Grade 4, XXVIII

I have neither given nor received help on these problems: _____

★ 1. Juan used his calculator to find the average temperature in his town, for the four seasons of the past year. He got the results shown below, in Fahrenheit degrees.



Spring Summer Fall Winter

Do you think he got reasonable answers, or do you think he probably made a mistake on his calculator? Why?

Answer: _____

★★ 2. Kitty mailed out 15 party invitations, and the stamps cost 20¢ each. She paid for the stamps with a five-dollar bill. How much change should she receive?

Answer: _____

★★★ 3. A snail climbs up a wall that's 20 feet high. Each day the snail climbs 5 feet, but each night it slips backward 4 feet. How many days will it take for the snail to get to the top of the wall?

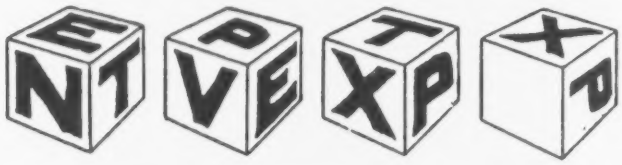
Answer: ____ days

★★★ 4. The *Least Common Multiple* (LCM) of two numbers is the smallest number that is a multiple of both. An easy way to find the least common multiple of two numbers is to take the larger of the two numbers and see if it is a multiple of the other. If not, double it and see if you have a multiple. If not, triple it and see. Keep on finding the multiples of the larger number, till you hit one that's also a multiple of the smaller number.

Find the least common multiple of the number pairs below. The first answer is given to you.

LCM(10,15) = 30 LCM(18,24) = ___ LCM(40,20) = ___ LCM(3,5) = ___

★★ 5. The four drawings below show different views of the same alphabet block. A letter is on each of the six faces. Draw in the missing letter on the block to the right, and be sure to position it correctly on the face.



★★★ 6. In the multiplication problem below, each letter stands for a digit, and none of them stands for zero. Find the digits, and rewrite the problem correctly to the right.

PUZZLE

```
  A B C D E
      X   4
-----------
  E D C B A
```

PROBLEM

```
      X 4
-----------
```

★★★ 7. Sam and Suzie are twins. Sam has as many brothers as he has sisters; Suzie has twice as many brothers as she has sisters. How many kids are in the family altogether?

Answer: _____ kids

Hint: Start guessing at how many brothers Sam might have, and check to see how many sisters Suzie would then have!

★★ 8. 2020 is a four-digit numeral, with a digit sum of 4. How many 4-digit numerals are there, with a digit sum of 4? (Don't count a numeral like "0022" as having four digits).

See! 2 + 0 + 2 + 0 = 4

Answer: ☐

WORKSHEETS

FOR

GRADE 5

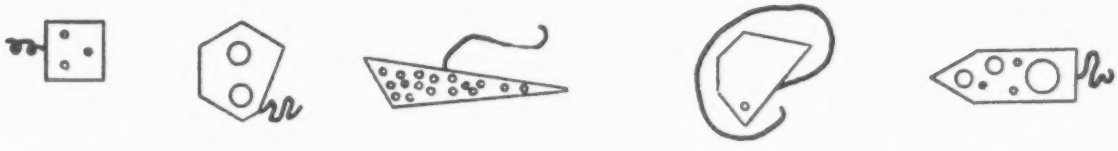
Star Problems
Grade 5, I

I have neither given nor received help on these problems: _____

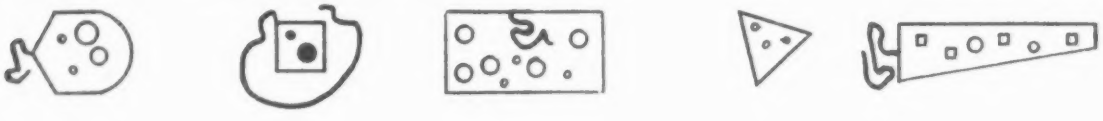
★★ 1. A school bus holds 42 students. It took 4 fully-packed buses, and a car holding 5 extra kids, to get the entire 5th grade class to a picnic. How many students attended the picnic?

Answer: _____ students

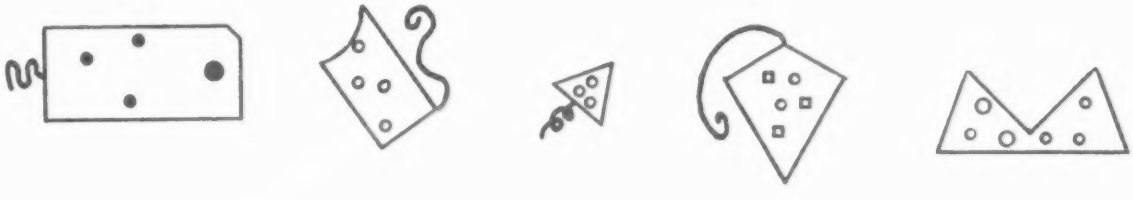
★★ 2. The five things below are all *smitherwithers*.



None of the things below are *smitherwithers*.



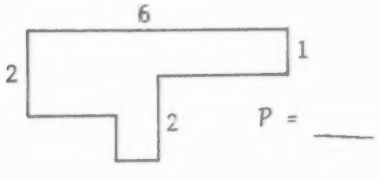
Which of the things below is a *smitherwither* ? Circle it.

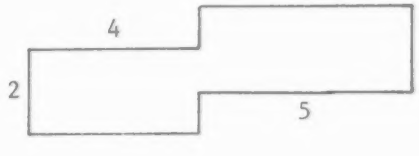


★ 3. Betsy bought a soft drink at the store, and gave the clerk a $5 bill. She received $4.93 in change. Do you think this sounds reasonable?

Answer: _____

★★ 4. Find the *perimeter* of each polygon below. Enough of the measurements are provided for you to be able to figure out the measurements that don't have numbers beside them.





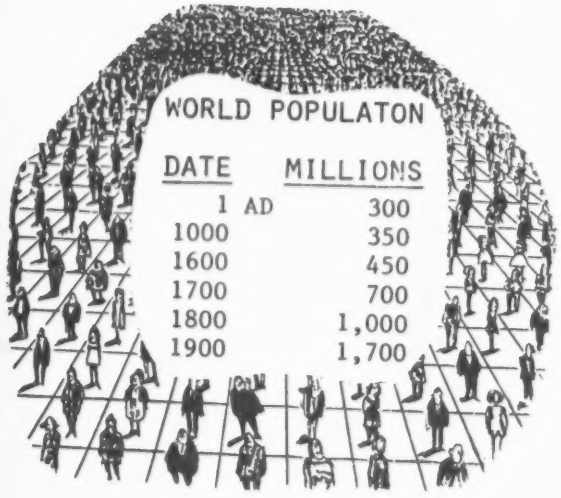
★★★★ 5. A man has his pet goose, pet fox, and a bag of corn with him as he is walking through the woods. He comes to a river, and there is only 1 boat for crossing. The boat will hold only the man and one other thing each time across the river.

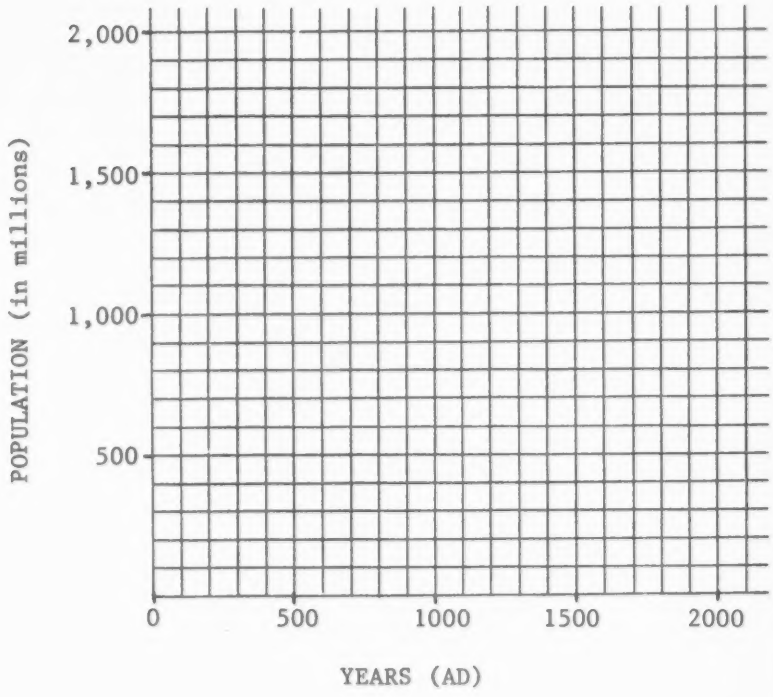
The man can't leave the fox and goose alone on the river bank, because the fox will eat the goose. He can't leave the goose and corn alone, because the goose will eat the corn. What's the fewest number of crossings he can make in the boat, to get everything on the other side? (A "crossing" means going from either side of the river to the other side.)

Answer: ___ crossings

Hint: Draw a diagram!

★★★ 6. Make a *line graph* of the world population figures shown below. Use the graph paper to the right.





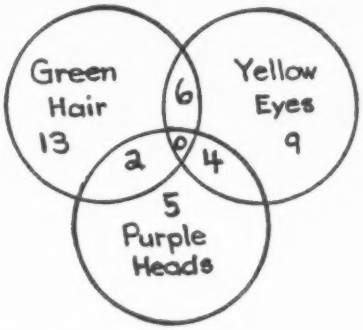
★★ 7. If the world population continues to increase as it has lately, about what will the world population be in the year 2,000 AD?

Answer: It might be as high as _____.

STAR PROBLEMS
Grade 5, II

I have neither given nor received help on these problems._____

★★★ 1. On the planet O'Nealeo, some creatures have green hair, some yellow eyes and some have purple heads. Use the circle diagrams to answer the questions.



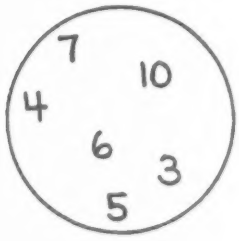
a. How many creatures have green hair?_____

b. How many creatures have yellow eyes and purple heads?_____

c. How many creatures have purple heads, yellow eyes and green hair?_____

★★★★ 2. Use every digit in the circle once only. Insert arithmetic symbols (+, −, ×, ÷) and end with the number one. Write your answer beside the circle. Use parentheses to help you.

(An example that doesn't work is:
(7-6) + (4-3) - (10÷5) = 0)



Answer: _____ = 1

★★★ 3. Billy Bob would like you to work for him for ten days. He will pay you one of these ways:

A. $6.00 each day for all ten days

B. $1.00 the first day, $2.00 the second day, $3.00 the third and so on

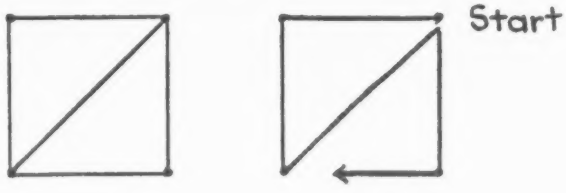
C. $ .10 the first day and each day twice the amount of the day before

Which way would you earn the most money? _____

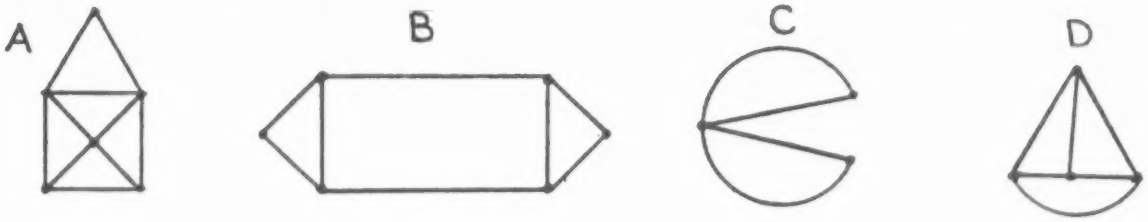
Which way would you earn the least money?_____

★★ 4. This is a traceable network. This means it can be drawn with one continuous line without lifting or retracing a line.

Example:

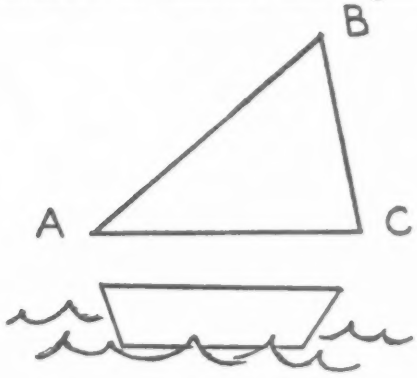


Which of the following are tracable?



Answer: _____

★★ 5. Use a protractor to measure the angles below.

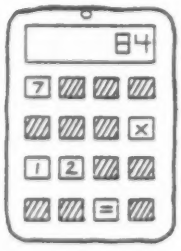


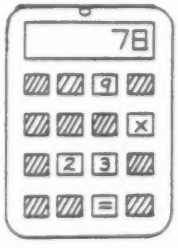
∠A = ____°

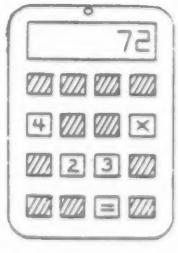
∠B = ____°

∠C = ____°

★ 6. Write the problems and answers.







_____ = _____ = _____ = _____

Star Problems
Grade 5, III

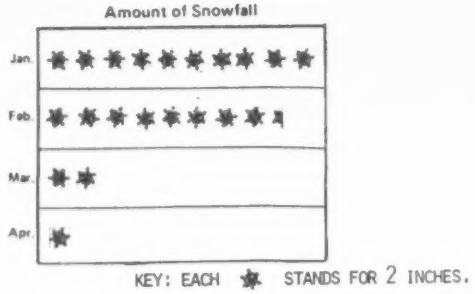
I have neither given nor received help on these problems: _____

★★ 1. There are 5,280 feet in a mile. When an airplane is flying at 35,000 feet above sea level, how high is it? Bubble-in the correct choice.

- ○ *7 miles high.*
- ○ *A little less than 7 miles high.*
- ○ *A little more than 7 miles high.*

★ 2. How much more snow fell in January than in April?

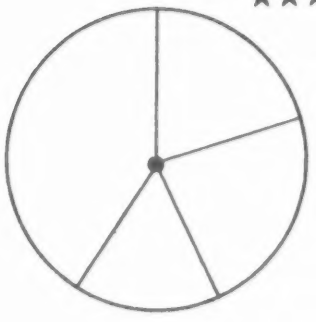
Answer: ___ inches more



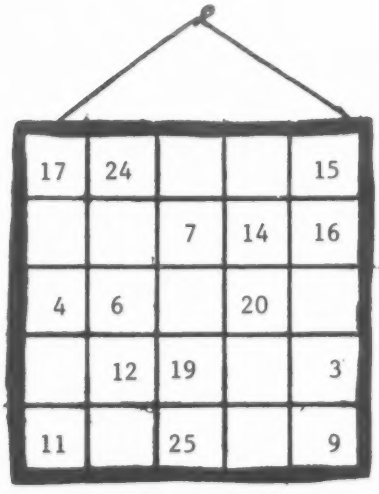
★★★ 3. A survey was done of the students at Pineview Elementary, and their favorite foods. The percentages below show which were the most preferred snacks:

Hot dogs preferred by 17%.
Peanuts preferred by 20%.
Popcorn preferred by 22%.
Cotton Candy preferred by 41%.

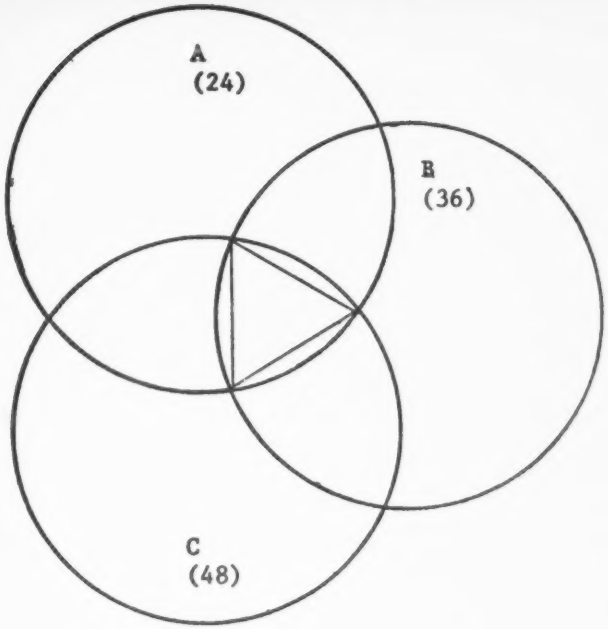
Label the circle graph to the left by putting the food in the correct section.



★★★ 4. In the chart to the right, put in the numbers from 1 to 25 so that the sum of any row, column, or main diagonal is 65. Some of the work has already been done for you.



17	24			15
		7	14	16
4	6		20	
	12	19		3
11		25		9



★★★ 5. In pencil:
List all the factors of 24 in circle A.
List all the factors of 36 in circle B.
List all the factors of 48 in circle C.

Leave the center area blank and:
Move any factors which circles A and B have in common to their overlapping area.
Move any factors which circles B and C have in common to their overlapping area.
Move any factors which circles C and A have in common to their overlapping area.

Now, move any of these common factors to the center triangle. (Hint: you should have six numerals in the triangle--beginning with 1 and ending with 12.)

★★★ 6. On which day was 21 the average number of ice cream cones sold?

Answer: _____

★★ The price is 75¢ per cone. How much tax was collected on the total sale of ice cream for Sept. 15, 1985? (Tax is 5% or 5¢ on each dollar.)

Answer: _____

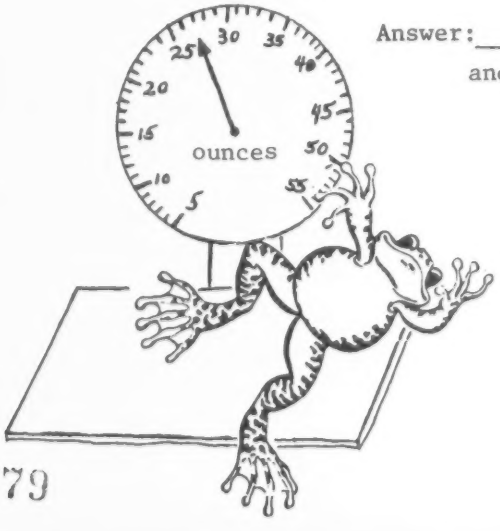
ICE CREAM CONES SOLD
Week of Sept. 14-18, 1985

Flavor	Mon.	Tues.	Wed.	Thurs.	Fri.
Chocolate	18	35	8	14	19
Vanilla	17	14	23	17	31
Strawberry	6	12	36	21	10
Banana	27	10	9	23	17
Bubblegum	23	9	18	34	19
Oreo chip	37	26	10	17	21

★★★ 7. A line of ducks was walking along, and there were two ducks in front of a duck and two ducks behind a duck. What's the fewest number of ducks that could be in this line?

Answer: ___ ducks

★ 8. How much did Fearless Froggy weigh before he took his final leap?

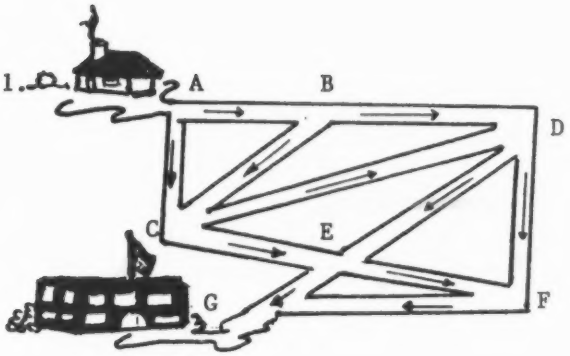


Answer: ___ pounds and ___ oz.

Star Problems
Grade 5, IV

I have neither given nor received help on these problems. _____

★★ 1.



Susie rides to school on her bike. She likes to take a different route each day. All the roads are one-way streets. She must ride only in the direction shown by the arrows on the map.

How many different routes from her house, A, to school, G, are possible?

Answer: _____

★★★ 2. Find the flying time for the listed flights (be careful of time-zone changes).

	Depart	Arrive	Flying Time
(a)	Baltimore, 7:20 a.m.	Boston, 8:24 a.m.	_____hr. _____min.
(b)	New York, 8:00 p.m.	Los Angeles, 9:53 p.m.	_____hr. _____min.
(c)	Salt Lake City, 9:30 a.m.	Phoenix, 10:00 a.m.	_____hr. _____min.

★★ 3.

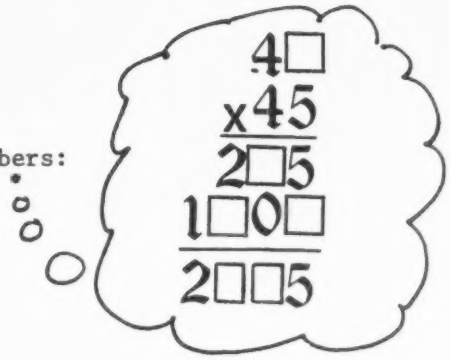
(a) Using the indicated prices, estimate the total cost of all four items, to the nearest whole dollar.

Answer: _____

(b) How much difference is there between your estimate and the exact cost?

Answer: _____

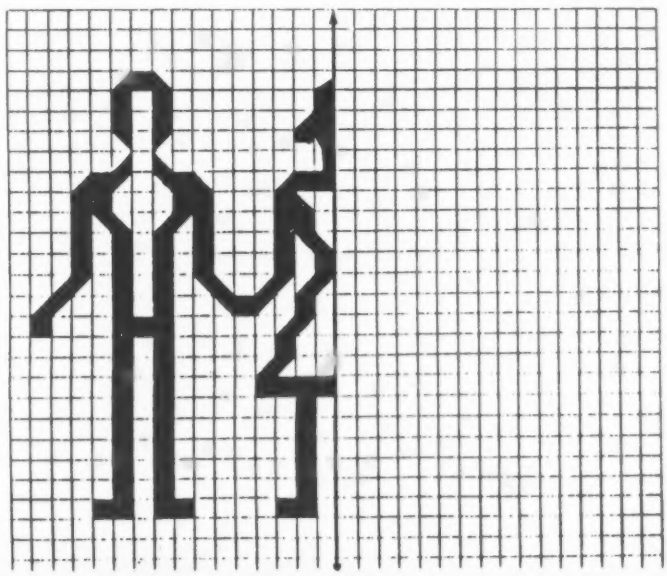
★★ 4. Fill in the missing numbers:



★★★ 5. Think of adding all of the odd numbers between 50 and 100. Would this sum be an even number, or an odd number?

Answer: The sum of the odd numbers from 50 to 100 is an _____ number.

★★ 6. Color in the squares to make the picture symmetric.



Star Problems
Grade 5, V

I have neither given nor received help on these problems: _____

★★ 1. Study the number pattern to the right. The dots mean that the numbers continue in this pattern. 17 is in Column D. In what column is 86?

Answer: 86 is in Column ___.

.	.					
.	.	.	.	.	.	.
.	.	.	.	.	.	.
21	22	.	.	.	.	.
14	15	16	17	18	19	20
7	8	9	10	11	12	13
0	1	2	3	4	5	6
A	B	C	D	E	F	G

★★★ 2. Using the same number chart as in problem 1, here is a code for writing numbers:

9 ↑ → → ↑ ↓ = 18

Find what number is given by:

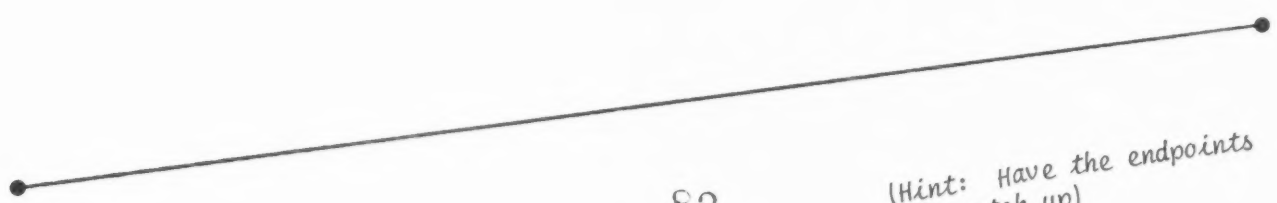
100 → ↑ → ↑ ↑ ← = □

★★ 3. Sarah ordered an egg salad sandwich with lettuce, potato chips, and a large cola. If she gave the clerk a 5 dollar bill, and the sales tax is 5¢ per dollar, how much change should she get?

Answer: _____

Sandwiches		Drinks		
			small	large
Ham	$1.95	Cola	.45	.65
Tuna	$1.59	Milk	.50	
Roast Beef	$2.15	Tea	.35	.55
Egg Salad	$1.39			
Extra: Cheese	.15	Potato Chips or		
Lettuce	.05	Corn Chips	.30	
Tomato	.05			

★ 4. Fold this sheet of paper so that the crease is the *perpendicular bisector* of the line segment below. *Perpendicular* means that your crease will make "right angles" where it meets the segment; *bisector* means that your crease divides the segment in the middle, exactly.



(Hint: Have the endpoints match up)

★★★★5. Most people who learn to multiply mentally will do the exact opposite of those who use paper-and-pencil. They'll multiply with the larger numbers first, and then move on to the smaller numbers--it is easier to add smaller numbers to larger ones, than the other way around!. Study how Patti is working below:

When you think you understand how to multiply this way in your head, practice on the problems below. Check your mental work using a calculator to see if you are correct.

Given: 36
x24

First I'll do 20x30 = 600, then add on 20x6 = 120, to give 720. I'll now add on 30x4 = 120, to get 840. Then I'll tack on 6x4 to get a total of 864. Whew!

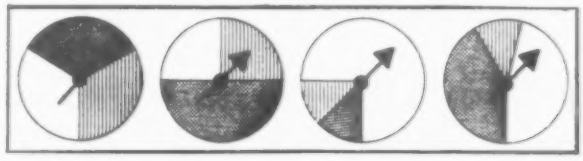
Practice problems:

42	51	24	53	45	41	24
x63	x42	x32	x14	x31	x23	x25

When you hand in your paper, you'll be given a problem similar to these--if you can do it in your head, you'll get your stars.

Answer later on: ☐

★★★ 6. Think about these spinners before you answer the questions below.



(a) *Put an X on the spinner that would give the best chance of winning if you were on the white team.*

(b) *What is the white team's chances of winning on the spinner with X ?* ☐

(c) *What is the chance that the white team would not win, on the spinner with the X ?* ☐

45 °C

★★ 7. The far left thermometer shows a reading of 45° C. Darken-in the other thermometer to show a reading that is 50° lower than this.

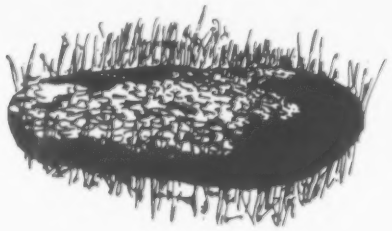
★ 8. What season of the year would it have to be, in Florida, to have an outdoor temperature of 36° C?

Answer: _____

Star Problems
Grade 5, VI

I have neither given nor received help on these problems: _____

★★★ 1. A patch of lily pads doubles its size each day, once it gets started growing in a pond. If a certain pond was completely covered on the 20th day of June, what part of the pond was covered in lily pads on June 18th?



Answer: ☐

★★ 2. Show what you know about metric temperatures. Circle the only answer beside each sentence that would make sense.

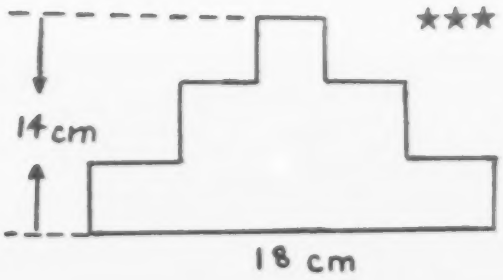
▲ It is snowing outside--what temperature is it?	20° C	0° C	32° C
▲ We're going swimming--what is the air temperature?	5° C	32° C	12° C
▲ The tea is boiling on the stove--how hot is the tea?	85° C	45° C	100° C
▲ What's the temperature of some ice cubes?	32° C	0° C	40° C
▲ Your normal body temperature is about what?	37° C	98° C	16° C

★★★ 3. A rule is used to change each first number below into the second number. Find the rule, and then use it to write in the number that matches with 50.

1 → 6
3 → 10
6 → 16
9 → 22
⋮ ⋮
50 → ☐

★★★★ 4. Work backwards with the rule above. What first number would have given 34 as the second number?

Answer: ☐



★★★ 5. What is the perimeter of the figure below? The figure is <u>not</u> drawn so that you can measure it.

Answer: ____ cm

★ 6. A rancher had 342 head of cattle before hoof-and-mouth disease began. All but 64 of his cattle died. How many were left alive?

Answer: ____

★★ 7. Re-write this riddle so it's easily understood:

The middle 3/5 of *SHOWS*	The middle 1/5 of *TRAPS*
The first 1/3 of *DOODLE*	The first 6/6 of *TURKEY*
The first 3/5 of *YOURS*	The middle 1/2 of *PINS*
The first 1/2 of *KEEPSAKE*	The first 8/11 of *SUSPENSEFUL*

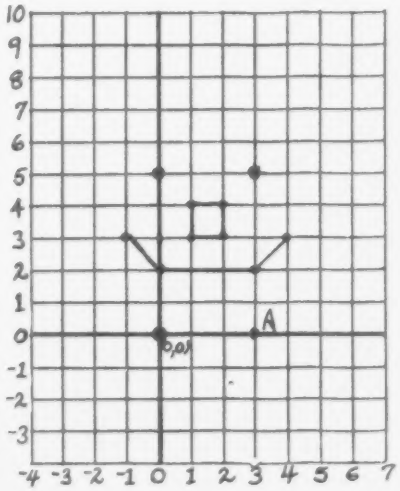
Answer: The riddle is: _____

★★★ 8. Joe bought 1/2 a case of cokes, and gave 1/6 of what he had to Sam. Mary bought 1/3 a case of cokes, and gave 1/4 of what she had to sheila. Who had the most cokes, Sam or Sheila?

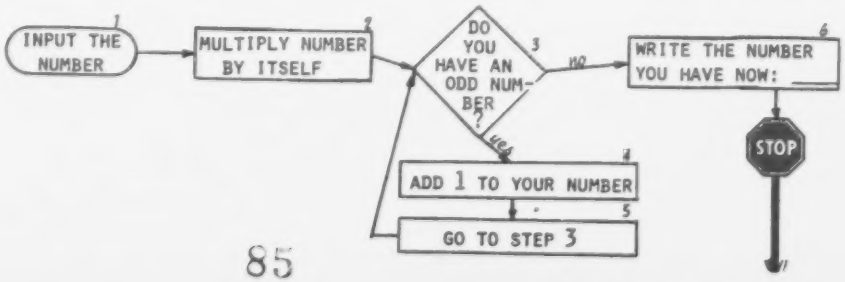
Answer: _____

★★★ 9. Find each one of the points below. Then draw a line that connects the letters in order, from A through J. Point A has already been located for you.

A = (3,0)
B = (5,2)
C = (5,7)
D = (4,10)
E = (3,7)
F = (0,7)
G = (-1,10)
H = (-2,7)
I = (-2,2)
J = (0,0)



★★ 10. Use 33 as the input number, and follow the flowchart below.



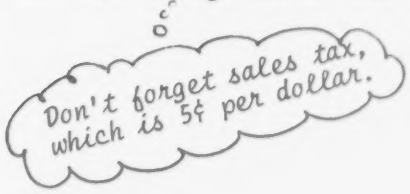
Star Problems
Grade 5, VII

I have neither given nor received help on these problems: _____

★★ 1. Six coins are in a sack. There is at least one of each type of coin, but there are more nickels than dimes, and more dimes than pennies. What is the total value of the coins?

Answer: _____

★★★ 2. Niki bought the shoes to the right, but on sale for "1/3 off the price on the tag." She gave the clerk two ten-dollar bills--how much change should she receive?



Answer: She should get ____ back as change.

★★★

	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23	24
25	26	27	28	29	30	31	32
33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48
49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64

3. Follow these directions with the numbers to the left:

a. Circle 2, and mark out all other multiples of 2.

b. Circle 3, and mark out all other multiples of 3.

c. Circle 5, and mark out all other multiples of 5.

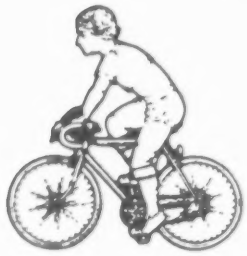
d. Circle 7, and mark out all other multiples of 7.

The numbers you have left in the chart above--either circled or not marked out--are the *prime numbers* less than 65. How many such prime numbers are there?

Answer: There are ___ prime numbers less than 65.

★★ 4. Sixty is a composite number, since it's marked out on the list above. But it can be written as the product of only prime numbers. Write sixty as the product of only prime numbers.

Answer: 60 = _____



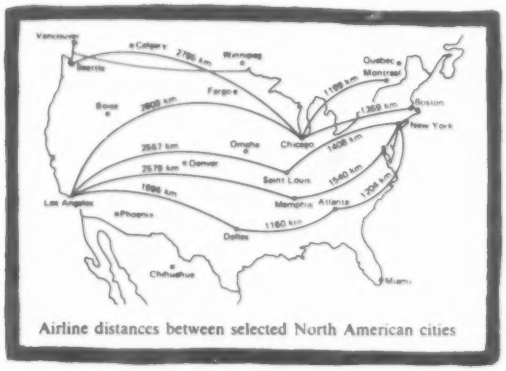
★★ 5. It takes Jake 30 minutes to go 5 miles on his bike. The school is 3 miles from Jake's house, and the park is 6 miles away. How long will it take for Jake to ride his bike to school?

Answer: __ minutes

★ 6. Which is longer, the *circumference* of Jake's bicycle tire, or the length of the bike itself (tip of front tire, to end of rear tire).

Answer: _____

★★



Airline distances between selected North American cities

7. Bubble-in the best estimate below of the Airline distance from Phoenix to Chihuahua, Mexico.

- (a) 1000 km
- (b) 1400 km
- (c) 1800 km
- (d) 2000 km

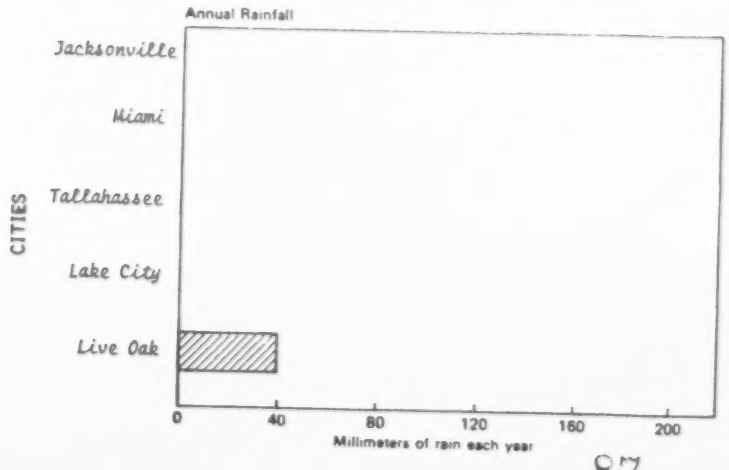
★★★★ 8. Use this information to draw in the bar for each Florida city, showing how much rainfall it gets each year.

(a) *Lake City receives twice as much rainfall as Live Oak.*

(b) *Miami receives 2½ times as much rainfall as Lake City.*

(c) *Miami gets the same amount of rainfall as Jacksonville and Live Oak together.*

(d) *Tallahassee's rainfall is the average of Miami's and Lake City's rainfall.*

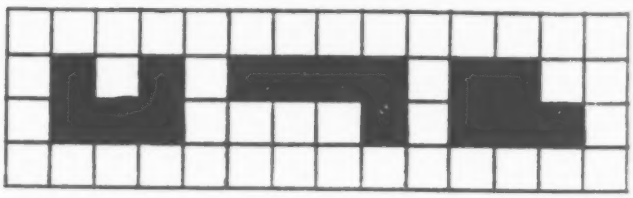


Star Problems
Grade 5, VIII

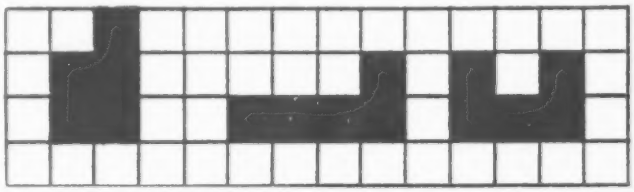
I have neither given nor received help on these problems: _____

★★★★ 1. A *pentomino* is a shape that can be made using 5 different squares, with each square touching an entire side of another square.

Examples of 3 pentominoes:



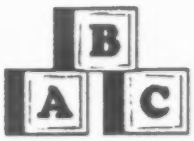
These don't count as different pentominoes, since they're like the ones to the left:



Draw as many different pentominoes as you can--a sheet of graph paper helps! How many *pentominoes* are there?

Answer: _____ different pentominoes

★★★ 2. Think about arranging 20 cubes in four piles, using these clues:

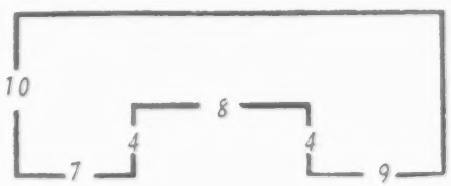


ALL PILES HAVE AN EVEN NUMBER OF CUBES.
THE 2ND PILE HAS TWICE AS MANY CUBES AS THE 4TH PILE.
THE FIRST PILE HAS THE MOST CUBES IN IT.
ALL PILES HAVE DIFFERENT NUMBERS OF CUBES.
EACH PILE HAS AT LEAST ONE CUBE.

Write the number of cubes that would be in each pile, in the boxes below:

★★★ 3. Find the area of the polygon to the right. (Hint: The area of a rectangle is the length times the width, and this polygon is made of rectangles.)

Answer: _____



★★ 3½. The sum of three *consecutive* numbers is 189. What are these numbers? (Hint: *Consecutive numbers* differ by one, such as 8, 9, and 10.)

Answer: ___, ___, and ___

★★★ 4. Use the code A=1¢, B=2¢, C=3¢, .., Z=26¢.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26

Can you find:

a. Two states in the United States, each worth < 40¢?
Answer_____, _____.

b. A state worth > 98¢ and < $1.00?
Answer_____.

c. A state worth > $1.60?
Answer _____.

★★ 5. Please compute the math problems on a calculator. To check your answer, turn the calculator upside down and find a word answer. Put the words in the appropriate blanks in the story.

Compute these problems on a calculator:

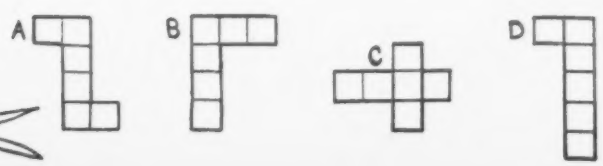
1. 526 + 374 x 9 - 382 =
2. 64 x 8 + 2 =
3. 456 x 81 - 1828 =
4. 12 x 9 - 74 =
5. 950 ÷ 25 - 4 =
6. 625 x 10 - 643 =
7. $6\overline{)33624}$ =
8. 12345 + 23456 - 465 =
9. 427 x 5 + 3204 =
10. 12 x 12 x 12 + 33278 =
11. $18\overline{)6210}$ =
12. 654321 ÷ 3 - 214238 x 2 =
13. 584 - 461959 =
14. 68 x 97 + 1122 =
15. 357 x 468 + 402061 - 107762 =
16. 59 x 59 + 123.45 + 99.55 =
17. 52715 - 20 + 350 =
18. $512\overline{)394752}$ =

Complete the story by filling in the blanks:

During a school break, Bill went to visit _____ grandparents on their farm in _____ , Idaho. _____ lived in Florida and had never been on a farm.

_____ enjoyed helping his grandfather gather _____ for the fire, slop the _____, and feed the _____. Grandmother gathered honey everyday from her _____ hive.

One day Grandmother cooked a _____. When it was time to eat, _____ rang the dinner _____. After dinner Grandfather took everyone on a _____ ride. When _____ got out of the _____, he stepped in a _____ full of water, got his _____ wet and was _____ the next day.



★★ 6. Circle the figures to the left which would fold up into a cube, if cut out and folded on the lines shown.

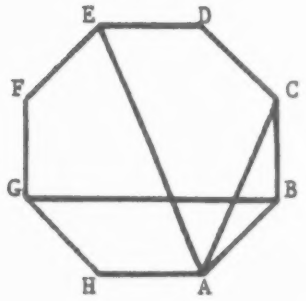
STAR PROBLEMS
Grade 5, IX

I have neither given nor received help on these problems._____

★ 1. Mary had been earning $3.25 an hour. This week she got a raise to $3.50 an hour. She works 40 hours each week. How much more will she make this week than she made last week?

Answer: She'll make _____ more this week than last week.

★★ 2.



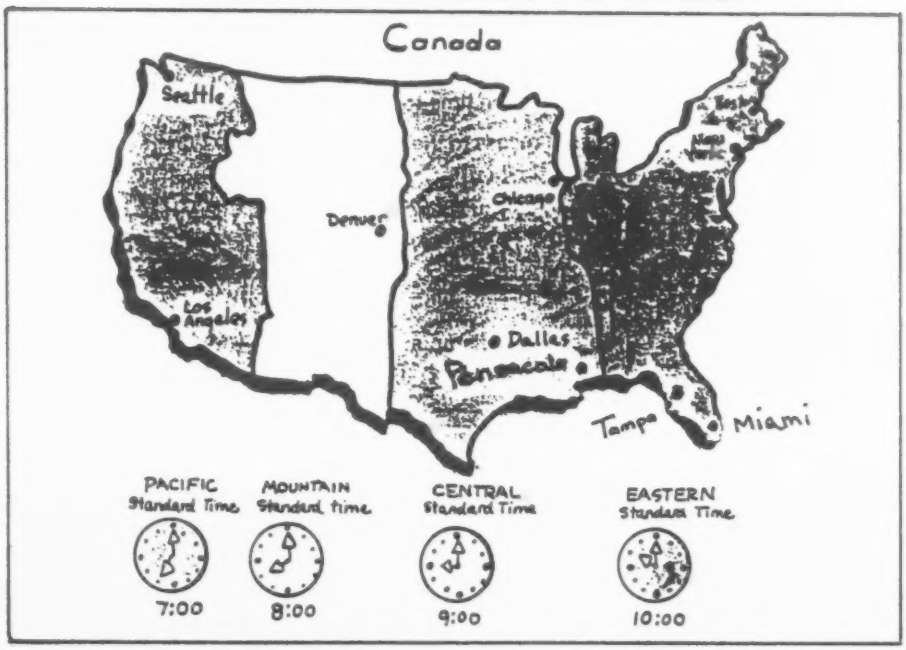
A diagonal joins two vertices of a polygon. Three diagonals of an octagon are shown: AC, AE, and GB.

What is the total number of diagonals that can be drawn in an octagon?

Answer: _____diagonals

★ 3. The table below shows the departure and arrival times of some flights. Arrivals and departure times are local times in those cities. Using the time zone map and the table, find the flight that would take 5 hours. Circle it.

FLIGHT	LEAVES	ARRIVES
Miami to Pensacola	9:00 a.m.	10:00 a.m.
Tampa to Los Angeles	8:00 a.m.	10:00 a.m.
Dallas to New York	7:00 a.m.	10:00 a.m.
Seattle to Boston	8:00 a.m.	3:00 p.m.



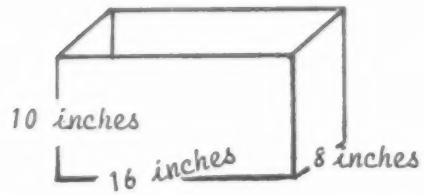
★ 4. Solve the following problem by using a calculator. Round your answer to the nearest hundredth.

$8\overline{)6.3}$ Answer: _____

★ 5. Fill in the missing squares so that the 4 rows, the 4 columns, and the 2 diagonals will all have the same sum.

289			292
300	306		297
313	291	290	316

★★ 6. Skip had a box that he needed to cover with contact paper for his science project. Find the amount, in square inches, needed to cover the box. (Hint: the box has no top.)

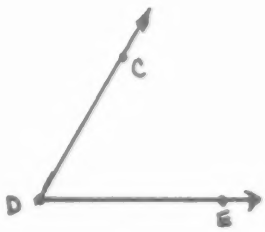


Answer: _____ square inches

★★★ 7. Use the picture of the box in problem 6 to determine how much sand the same box will hold. (Hint: Find the volume of the box.)

Answer: _____ cubic inches

★ 8. Fold your paper so that you bisect the angle. Trace the fold line with your pencil.



★★ 9. Use a protractor to give the measure of each half of the bisected angle. Bubble-in the best answer below:

- ⬭ Each half of the bisected angle measures 30° Fahrenheit.
- ⬭ Each half of the bisected angle measures 60° Celsius.
- ⬭ Each half of the bisected angle measures 30°.
- ⬭ One half of the bisected angle weighs 45°, while the other weighs 15°.

STAR PROBLEMS
Grade 5, X

I have neither given nor received help on these problems._____

★★★★ 1. James wanted to teach the Logo turtle to draw a square on the computer screen. Write the letter for the set of directions that would not make the square.

A.
```
FORWARD 50
LEFT 90
FORWARD 50
LEFT 90
FORWARD 50
LEFT 90
FORWARD 50
```

B.
```
FORWARD 50
RIGHT 50
FORWARD 50
RIGHT 50
FORWARD 50
RIGHT 50
FORWARD 50
RIGHT 50
```

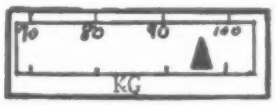
C.
```
FORWARD 30
FORWARD 20
RIGHT 90
FORWARD 50
RIGHT 90
FORWARD 50
RIGHT 45
RIGHT 45
FORWARD 50
```

D.
```
REPEAT 4 [FORWARD 25
          RIGHT 90]
```

Answer:_____

Hint: In Logo, "Forward 50" means move forward 50 paces. "Right 90" means to make a 90° right turn.

★ 2. The football player stepped on the scale. Bubble in the best estimate of his weight:



○ 92 kg ○ 98 kg
○ 95 kg ○ 100 kg

★★★ 3. Students arrived for school in groups. Bill was the first to arrive. (Consider him the "first group".) Each group that arrived after Bill had two more persons than the group that arrived before them. How many people were in school after 20 groups arrived?

Answer:_____

★ 4. Joan has a science project due in two months. She discovered that she does not have all the materials needed for the experiment. The experiment takes one month to complete, but it takes three weeks for the science supply company to deliver the materials. How long can Joan wait before she sends in her order?

Answer:_____

★★ 5. Estimate the distance from New Orleans to Seattle by way of San Francisco. Circle your answer.

A. about 2000 km

B. about 3500 km

C. about 5000 km

★ 6. Here is a flowchart for planning a party.

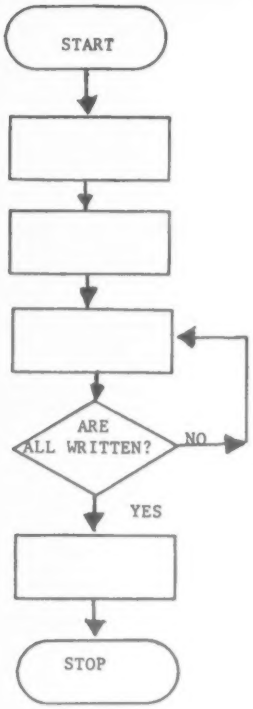
Put the letter of each direction in the correct place.

A WRITE AN INVITATION

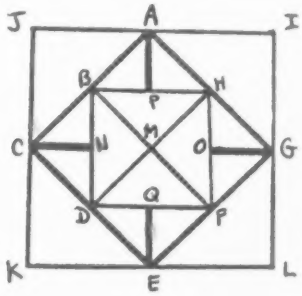
B PLAN THE PARTY

C MAIL THE INVITATIONS

D MAKE THE GUEST LIST



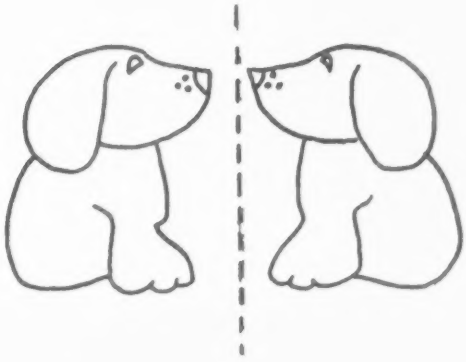
★★★★ 7. What is the greatest number of triangles in the figure below?

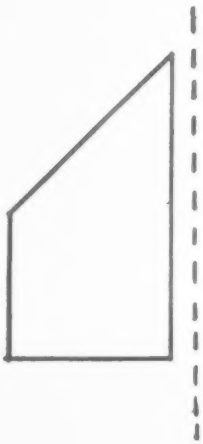


Hint: Make an organized list of the triangles--concentrate on one part of the figure at a time!

Answer: _____

★ 8. The picture of the dog has been flipped along the dotted line. In the space draw the flip of the shape on the right.





STARS PROBLEMS
Grade 5, XI

I have neither given nor received help on these problems._____

★★ 1. Mr. Smith pays $78 a month for his apartment. His telephone bill is $12.43 each month. How much is Mr. Smith's yearly rent?

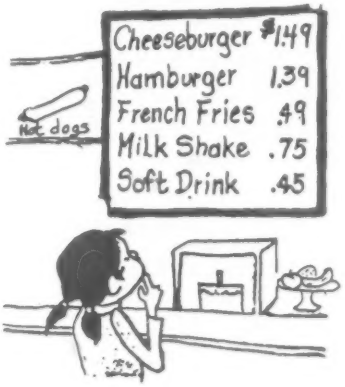
Answer: _____

★★ 2. Patty bought one thing to eat and one thing to drink. Including the 6¢ tax, she had to pay exactly $2.00. What did she buy?

Answer: _____

and

_____

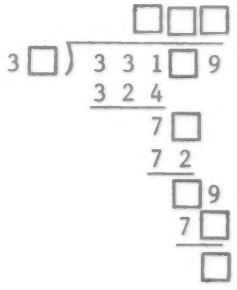


★ 3. Circle the answer.

A can of soda contains approximately

354 l 354 ml 354 cl

★★★ 4. Fill in the squares.



★★★ 5. Which whole numbers, when substituted for X, would make this a true mathematical sentence?

$$X \leq (2 \div 2) + (5 \div 5)$$

Set A = {0, 1, 2} and Set B = {0, 1, 2, 3}

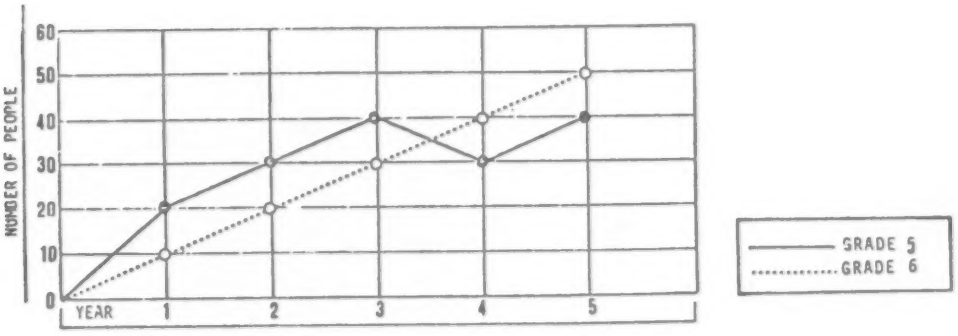
Circle the correct set of numbers above that could be used to substitute for X.

★★ 6. The parade began promptly at 6:45 p.m. The last float passed by the reviewing stand at 9:15 p.m., signalling the end of the parade. How long did the parade last?

Answer:_____hours and _____ minutes

★★★★ 7. Each year for five years, Mr. Brown's students kept a record on the number of people visiting the fifth and sixth grade classes during "Open School Night". Use the information given in the graph below and find the difference between the <u>total</u> numbers of people visiting the fifth and sixth grade classes during the five-year period.

OPEN SCHOOL NIGHT ATTENDANCE



Answer: _____

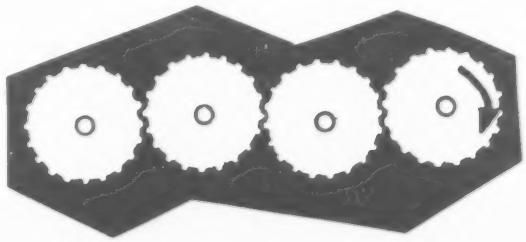
★★★ 8. Use a calculator to compute:

$$\{(297 \times 35) + (146 \times 23)\} \div 4 = \_\_\_\_\_$$

★ 9. Look at the gears below. The one on the right end is turning clockwise. As it does, it turns the one next to it, and this continues down the line. In which direction does the gear on the far left turn? Bubble-in your answer.

○ Clockwise

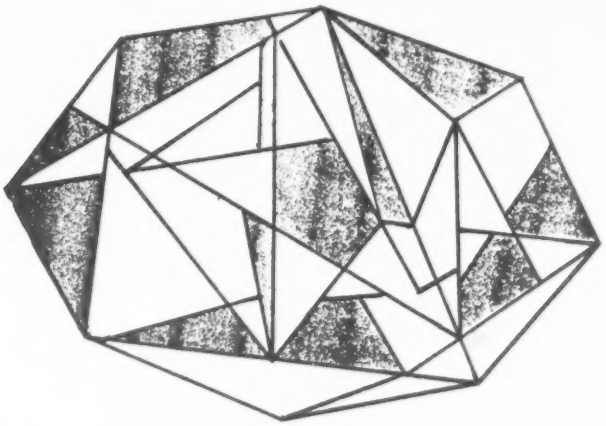
○ Counterclockwise



STAR PROBLEMS
Grade 5, XII

I have neither given nor received help on these problems: _____

★★★ 1. An *equilateral triangle* is a special triangle that has all three sides equal. It also has all three angles equal. There are a whole bunch of triangles in the shape below, but only one of them is *equilateral*. When you've found it, color it red.

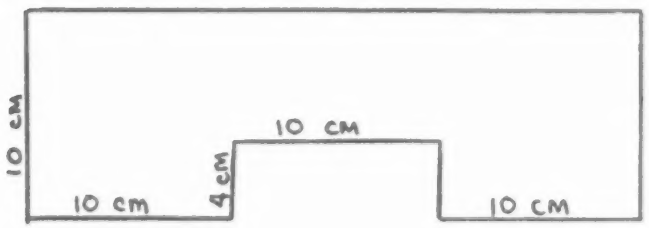


★★ 2. Jack earns $5 for each lawn that he mows. He cuts the grass on one yard after each school day, and cuts 2 lawns on Saturday. But his parents charge him 1/5 of what he collects for using their lawn mower and gasoline. How much does he have left to spend, at the end of a week?

Answer: _____

★ 3. What is the perimeter of this figure--it's not drawn to scale, so you'll have to figure out the missing numbers from those that are there.

Answer: The perimeter is ____ cm.



★★★ 4. A certain rectangle has a perimeter of 32 feet, and an area of 48 ft^2. What is its length and width?

Answer: The length is __ feet, and the width is __ feet.

★★★★ 5. Mrs. Jones had some white paint and some green paint, and a bunch of wooden cubes. Her class decided to paint the cubes by making each face either solid white or green. One kid painted his cube with all 6 faces white--another kid painted her cube solid green. But another painted 4 faces white and 2 faces green.

How many cubes could be painted in this fashion, so that each cube is different from the others? Two cubes are alike if one can be turned so that it exactly matches, color for color on each side, the other cube.

Answer: ☐ different cubes can be made.

★★ 6. Mary is going to make a map of Florida, using a scale of 100 miles equals 1 inch. Florida is about 390 miles long and 370 miles wide. What is the smallest piece of paper she can use ? Bubble-in your answer.

- ○ 1. 3½ in. by 3½ in.
- ○ 2. 4 in. by 4 in.
- ○ 3. 4½ in. by 4½ in.
- ○ 4. 5 in. by 5 in.

★★★★ 7. Sit on the floor 10 feet away from a regular-sized waste basket, with a crumpled sheet of paper. Shoot at the waste basket 10 times, and count the number of times you get it in the basket. Record your results on the first line of the chart below.

Trial	Date	Shots made
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

Repeat this experiment nine more times this week, and record your results. After you're through, compute the average number of shots you made, out of 10 throws, for the entire experiment.

The average you find above by totaling the number of shots made altogether, and dividing by 10, will probably give a decimal number. If so, round it to the nearest whole number, and complete the probability statements below:

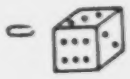
The chance that I'll make a basket, on any particular throw, is about: [10]

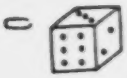
The chance that I won't make a basket, on any particular throw, is about: ☐

STAR PROBLEMS
Grade 5, XIII

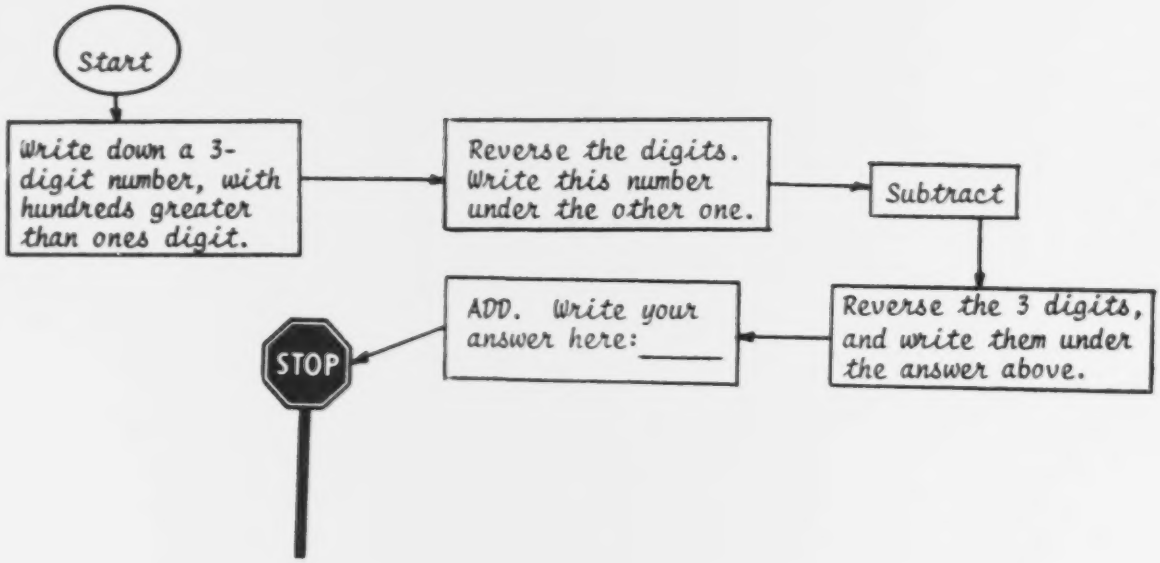
I have neither given nor received help on these problems: _____

★ 1. Which of the choices below is another view of this die? Bubble-in your choice:





★★ 2.


Start
Write down a 3-digit number, with hundreds greater than ones digit.
Reverse the digits. Write this number under the other one.
Subtract
Reverse the 3 digits, and write them under the answer above.
ADD. Write your answer here: _____
STOP

★★ 3. WHAT HAS 88 KEYS, BUT CAN'T OPEN ANY LOCKS?

To solve this riddle, find the answer to each problem. Write the coded letter in the boxes for each answer. Remember, work inside the parenthesis first.

P = (236 + 284) - 492

A = 36 ÷ (4 - 1)

A = (103 - 97) x 2

O = (54 x 6) ÷ 9

I = (588 ÷ 7) - 59

N = 78 ÷ (30 ÷ 5)

Answer:

☐	☐	☐	☐	☐	☐
12	28	25	12	13	36

★★★ 4. For the figures below, count the number of *edge points*, *inside points*, and then find the area of the figure. Record your results in the chart below the grid. (The first figure, A, has been done for you so you can figure out what *edge point* and *inside point* mean.)

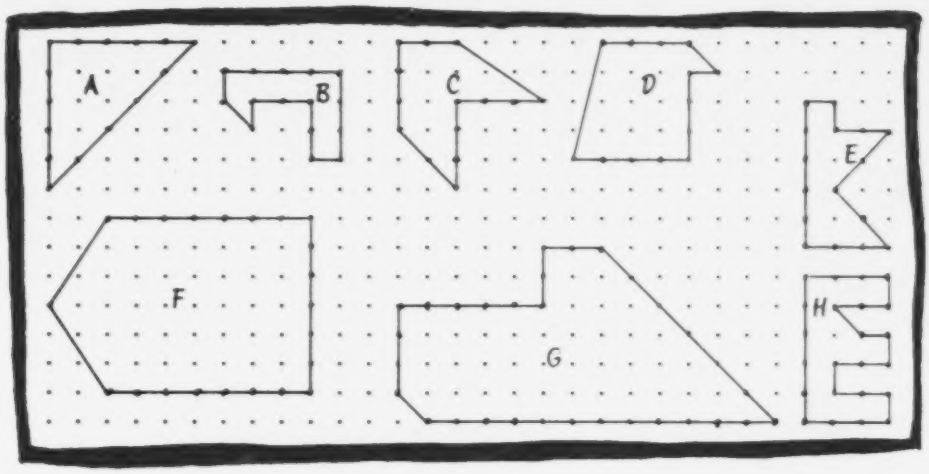


figure	number of edge points	number of inside points	area of figure
A	15	6	12½
B			
C			
D			
E			
F			
G			
H			

★★★★ 5. There is a relationship between the number of edge points and inside points, and the area of the figure. See if you can figure out a way to calculate the area of the figure, if you know the other two numbers. Examine the chart above very closely, and look for a pattern.

Answer: To find the area, I can _____

_____

_____.

Hint: Look at the edge points, divided by 2!

STAR PROBLEMS
Grade 5, XIV

I have neither given nor received help on these problems: _____

★★ 1. Select the next number or symbol to be used in continuing the pattern started below.

(a) 2, 4, 6, 8, ____

(b) 1, 3, 5, 7, ____

(c) 0, 3, 6, 9, ____

(d) 3, 7, 11, 15, ____

(e) 360, 180, 90, _____

(f) A_1Z_{26}, B_3Y_{24}, C_5X_{22}, _____

(g) 1, 2, 4, 7, _____

(h) $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, ☐

★ 2. Determine if the answers to the following are prime numbers. Write "P" in the blank by each prime number.

a. The number of days in the month of October._____

b. Seven dozen donuts. _____

c. $7^2-(4x11)$ _____

★ 3. Estimate the answer. Bubble-in the best estimate.

394 x 43 - 11 = ☐

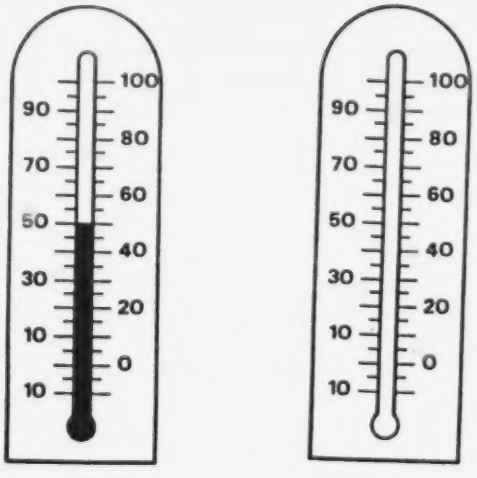
○ a. 17,900

○ b. 18,000

○ c. 16,931

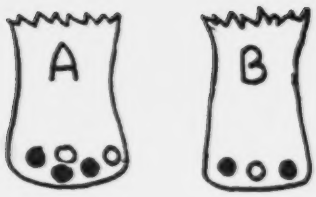
○ d. 16,000

★ 4.



If the temperature at noon rises one half of what it was at 7:00 am, color in the temperature at noon.

★★★★ 5. Bag A has 3 black marbles and 2 white marbles.
Bag B has 2 black marbles and 1 white marble.

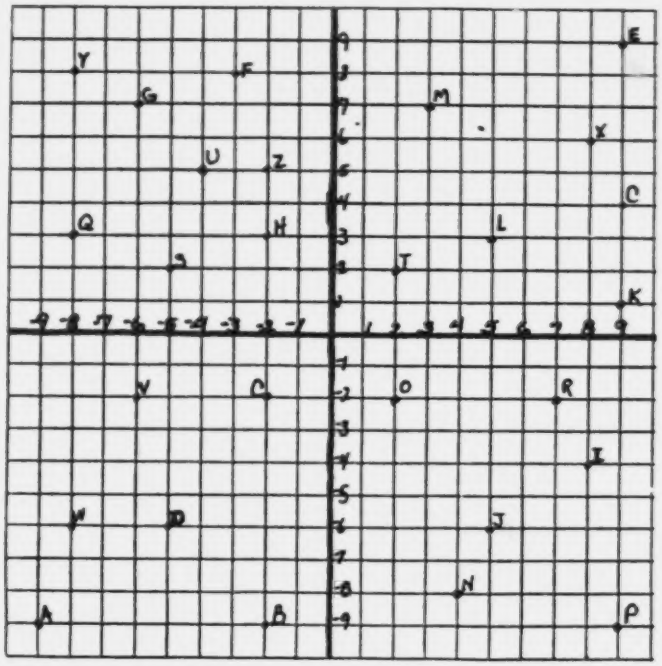


If you have to pick a black marble to win a prize and you must not look in the bag, which bag would give you the best chance of winning?

Bubble-in your answer:

- ○ Bag A has the best chance.
- ○ Bag B has the best chance.
- ○ The bags have the same chance of winning.

★★★ 6. Put the letter of each coordinate pair on the blank above the pair.



(-3,8) (5,3) (2,-2) (7,-2) (8,-4) (-5,-6) (-9,-9)

(-5,2) (2,2) (-4,5) (-5,-6) (9,9) (4,-8) (2,2) (-5,2)

(-9,-9) (7,-2) (9,9) (-5,2) (2,2) (-9,-9) (7,-2) (-5,2)

★ 7. Fill in the missing numbers in this sequence:

8 16 32 ___ 128 256 ___ 1024 . . . . .

★ 8. Fill in the missing letter of the alphabet: M V E M J S U N ☐

STAR PROBLEMS
Grade 5, XV

I have neither given nor received help on these problems: _____

★★★★ 1. Take two strips of newspaper about 2 inches wide, and tape one of them with its ends together without any "twists" put in. It'll look like:

Then take the other one, but put a "half twist" in before you tape the ends together. It'll look like:

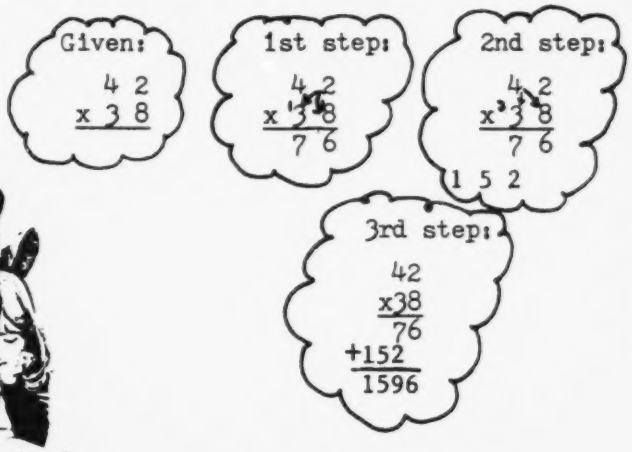
With a color crayon or marker, try coloring only one side of the two figures, as shown below:

If you did everything correctly above, you should know that one of the things you made has 2 distinct sides to it, but the other one has only 1 side to it--amazing! Circle the figure you made that has only 1 side to it.

★ 2. $12\frac{5}{8} + X = 24$. Is X greater than, or less than, a dozen?

Answer: _____

★★★ 3. A fifth grade student often drove her teacher nuts by turning in multiplication problems that looked weird! She always got the correct answer, but her work didn't look like anyone else's in the class. Here's what she did:



Now do these problems this new way:

$$\begin{array}{r} 14 \\ \times\ 26 \\ \hline \end{array} \qquad \begin{array}{r} 31 \\ \times\ 53 \\ \hline \end{array}$$

Sit Back and Tune In!
PLAYER WON LOST
Tom Seaver..... 10 6
Craig McMurtry.... 17 14
Steve Rogers..... 10 13
Len Barker..... 1 4
Steve Carlton..... 23 11
LaMarr Hoyt..... 11 9
Jim Palmer..... 5 6

★★ 4. What was the average number of games won by the baseball pitchers to the left? ____ What was the average number of games lost? ____

★ 5. The *mode* of a group of numbers is the number that occurs most often. What is is *mode* for the list of games won by the 7 pitchers? ____

★ 6. The *median* of a set of numbers is the number that's right smack in the middle, once you line them up from smallest to largest. What's the *median* of the list of games lost by the 7 pitchers? ____

★ 7. Tim is 17 years old. He is 6 years older than his brother, and 10 years older than his sister. How old was his brother two years ago?

Answer: ___ years old

★ 8. $4\frac{1}{2} + 3\frac{1}{2} - 2\frac{1}{2} - 1\frac{1}{2} + 3\frac{1}{4} + 2\frac{1}{4} - 6\frac{1}{2} =$ ☐

★★★ 9. If you ever try to read an electric meter, you'll probably notice that the little wheels showing how much electricity you're using turn in opposite directions. The one on the far right turns clockwise, the one next to it counter-clockwise, then clockwise, then counter-clockwise, etc. This is shown below:

THE CORRECT READING IS: 7 0 4 9 2

Now see if you can read one of these meters correctly yourself. Circle the choice that you think is correct, for this meter reading:

A. 12057 C. 22957

B. 12857 D. 12967

STAR PROBLEMS
GRADE 5 XVI

I have neither given nor received help on these problems.

_____

★★ 1. If you drink three cans of soda each week, how many milliliters would you drink in one year?

(1 can = 354mL) ANSWER:_____mL

★★ 2. Billy and Sam split a hamburger but Billy didn't have enough money to pay for his half of the $1.20, so he owes Sam 15¢. How much did Billy already pay?

ANSWER:_____

★★★ 3. Sale: 3/8 off the marked price. How much will the funny glasses cost?

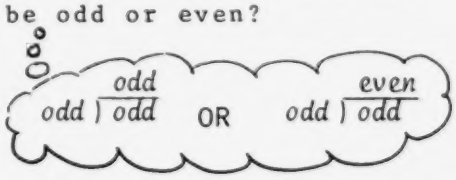
ANSWER:_____

★ 4. Put <, >, or = in the circle.

3/8 + 2/4 ◯ 2/8 + 1/4

★★ 5. If you divide an odd number into an odd number without a remainder, will your answer be odd or even?

ANSWER:_____



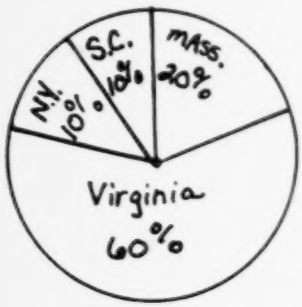
★★ 6. 1 kilometer (km) = 1,000 meters(m), so

2km = _____m and 1500m = _____km.

★★★ 7. How many of the first ten presidents were born in Virginia?

ANSWER:_____

Birthplaces of first ten presidents



★★★ 8. How can you make change for a dollar bill using exactly 50 coins? Fill in the blanks to show the number of coins.

_____pennies _____nickels _____dimes _____quarters

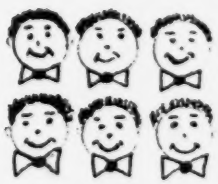
★★ 9. In a previous problem, you learned that a *diagonal* of a polygon is a line segment that joins any two non-adjacent sides. How many *diagonals* are there for a hexagon?

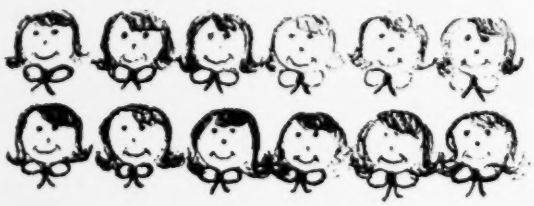
Answer: ____ diagonals

Hint: Mary started solving the problem, but her paper got torn. Can you get a hint from it?

★★★★ 10. Together, 6 boys and 12 girls weigh 1020 pounds. The boys all weigh the same. Each girl weighs 50 pounds. What is the weight of one boy?

Answer: Each boy weighs ___ pounds.

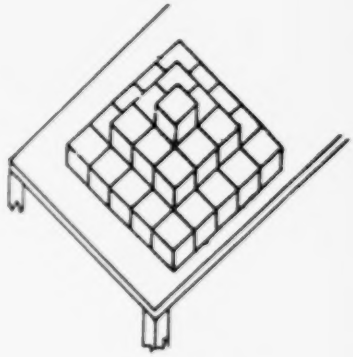




Star Problems
Grade 5, XVII

I have neither given nor received help on these problems: _____

★★★ 1. The figure to the right shows 3 layers of cubes with no gaps. Each cube is 1 cm on each edge.



(a) What is the *volume* of the figure? ___ cm^3

(b) What is the *surface area* of the figure, not counting the bottom part that touches the table? ___ cm^2

(c) If the whole outside of the figure were painted red, except the part touching the table, how many cubes would have red paint on 3 faces? ___ cubes

2.

SANDWICHES		DRINKS	sm.	lg.
Ham	$1.95	Cola	.45	.65
Tuna	$1.59	Milk	.50	
Roast Beef	$2.15	Tea	.35	.55
Egg Salad	$1.39			
Extra: Cheese	.15	Potato Chips or		
Lettuce	.05	Corn Chips	.30	
Tomato	.05			

★ a. Sarah ordered an egg salad sandwich with lettuce, potato chips and a large cola. What did she pay? (tax was 12¢)

Answer _____

★★ b. Bunny ordered milk and a ham and cheese sandwich with lettuce and tomato. How much change would she receive from $5.00? (tax was 14¢)

Answer _____

★★ c. Carolyn ordered a tuna fish sandwich with lettuce and tomato, potato chips and a large iced tea. The sales tax rate is 5%. How much was Carolyn's bill?

Answer _____

★★★ d. Arlene's bill was $2.73. She ordered only two items and nothing that any of her friends ordered. (tax was 13¢) What did she order?

Answer _____

★★ 3. Joe bought 1/2 of a case of cokes and gave 1/6 of what he had to Sam. Mary bought 1/3 a case of coke and gave 1/4 of what she had to Sheila. How many more cokes did Sam have than Sheila?

Answer _____

★★★ 4. For which whole numbers X are both statements below true mathematical sentences?

$8 + X > 75$ and $X < 84$

Answer: X = _____

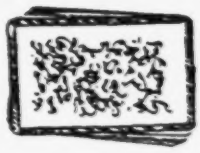
★ 5. Copy the following triangle. Cut it out. Fold to see how many lines of symmetry there are.

Answer_____ lines of symmetry

★★★ 6. Sharon sailed her boat from Miami to Nassau. She left at 7:01 A.M., Monday and arrived on Tuesday at 8:40 P.M. How long did her trip take?

Answer_____

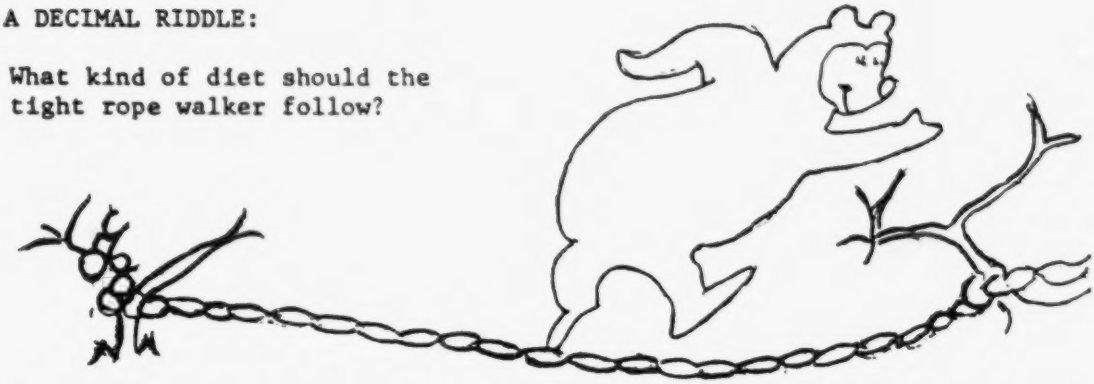
★★★ 7. The two "up cards" are the only ones taken out of the deck. What are your chances that when you turn over the next card that it will be a number between the cards that are showing? Give your answer as a fraction.



Answer_____

★★ 8. A DECIMAL RIDDLE:

What kind of diet should the tight rope walker follow?



Round the number under each blank to the nearest *hundredths*. Find your answer using the chart at the bottom of the page. Place that letter on the blank to answer the riddle.

.048	.214	.052	.481	.049	.044	.364	.368	.487	.486	.481	.366	.059

A .05	D .49	L .48
B .21	E .37	N .04
c .36	I .48	T .06

STAR PROBLEMS
Grade 5, XVIII

I have neither given nor received help on these problems:_____

1. The map below shows the four time zones in the United States. The clocks in the Pacific Time Zone are set 3 hours earlier than those in the Eastern Time Zone.

★★ a. If you flew to California on a plane that left Miami at 3:45 PM, and the flight took 5 hours, what would be the time on the airport clock when you landed?
Answer:_____

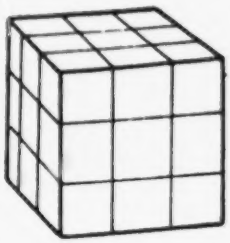
★★★ b. If you left California at 11:45 AM on a 6-hour flight to New York, what time would show on the airport clock when you arrived?
Answer:_____

★★ 2. Together, 6 boys and 12 girls weigh *1050* pounds. The boys all weigh the same. Each girl weighs 55 pounds. What is the weight of one boy?

Answer: ____ pounds

★★★★ 3. Twenty-seven small, wooden cubes were stacked up together to make the large cube below. Then the whole outside of the large cube was painted red. After the paint dried, it was taken apart again.

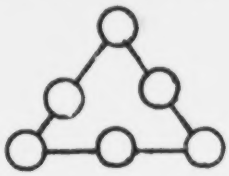
a. How many small cubes had red paint on three faces? ____
b. How many of the small cubes were red on only two faces?____
c. How many had red paint on exactly one face?____
d. How many cubes did not have any paint on them?____
e. How many faces are painted?_____



★★ 3½. The block pictured above was made from 27 wooden cubes, and it has 3 faces along each of its edges. How many wooden cubes would it take to make a block with 4 faces on each edge?

Answer: ___ wooden cubes

★4. Put the numbers 4,5,6,40,50 and 60 in the circles. The product of of the three numbers on each side of the triangle must be 1200



★★★★5. Do you know much about metric units? If so, circle the answer below that would make sense.

a. Height of a desk	97 mm	97 cm	97m
b. Mass (weight) of a small dog	3200 mg	3200 g	3200 kg
d. Volume of a can of cola	36 ml	360 ml	3600 ml
d. Temperature on a cold day	40°C	10°C	50°C

★★ 6. You put 50¢ into a drink machine. If you are blindfolded and choose a drink from the machine, what is the probability of <u>not</u> selecting 7-Up?

Answer: ☐

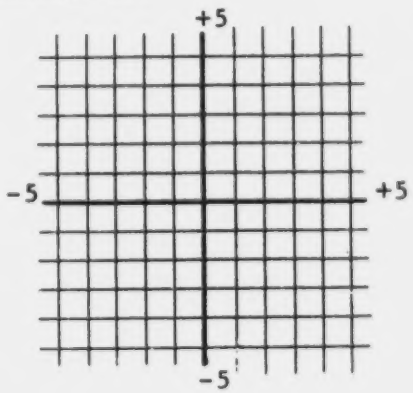
★★★ 7. A "perfect number" is one which is the sum of its proper divisors. Six is the first "perfect number" because the proper divisors of 6 are 1, 2, and 3, and 1+2+3 = 6.

There is a "perfect number" between 20 and 30. Find it! Answer: ___

★★ 8. Connect the following coordinates:

a. (1, 3) to (1, 4)
b. (1, 4) to (3, 4)
c. (3, 4) to (3,-3)
d. (3,-3) to (1,-3)
e. (1,-3) to (1, 0)
f. (1, 0) to (2, 0)

g. (-4,-3) to (-4, 4)
h. (-4, 4) to (-2, 4)
i. (-2, 4) to (-2,-3)
j. (-2,-3) to (-4,-3)



STAR PROBLEMS
Grade 5, XIX

I have neither given nor received help on these problems. _____

★★ 1. Fill in the missing digits.

$$\begin{array}{r} \square 2 \square 7 \\ \square 5 \overline{)\,8\,2\,3\,7\,1} \\ -\square 5 \\ \hline 1\,7\,3 \\ -1\,3\square \\ \hline 4\,3\,7 \\ -3\square 0 \\ \hline 4\,7\,1 \\ -4\,5\,5 \\ \hline 1\,6 \end{array}$$

2. 1 is the first square number because •

4 is the second square number because ••
••

9 is the third square number because •••
•••
•••

★ a. List the next five square numbers.

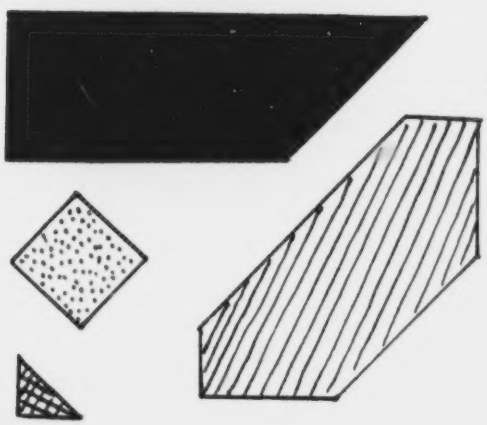
_____ _____ _____ _____ _____

★★ b. What would be the 18th square number? _____

★★ 3. Place the digits 1, 2, 4, 7, and 9 in the boxes below so that you'll get the largest possible product.

□□□
×□□
_____

4. This unit of measure is a square centimeter. (cm^2) ■
Find the area of each region below and write it in the blank.



★★ a. Shaded: _____ cm^2

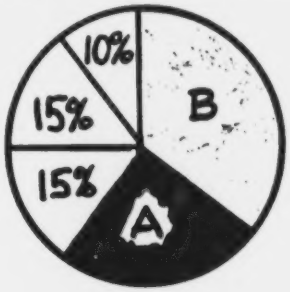
★ b. Dotted: _____ cm^2

★★ c. Striped: _____ cm^2

★ d. Crossed: _____ cm^2

5. ★ a. What percentage of the circle is labeled A? _____%

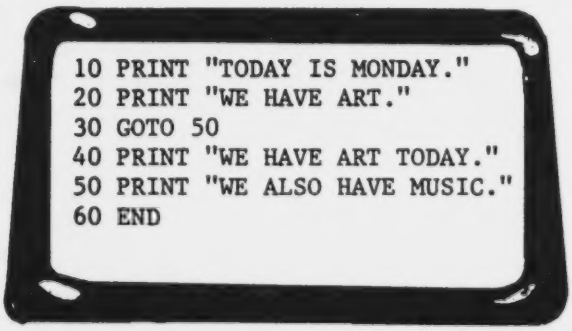
★★ b. What percentage of the circle is labeled B? _____%



★★★ 6. John was bouncing a ball. He noticed that it often bounced away at the same angle it met the pavement. Measure the angle of this bounce.

_____ degrees

★★ 7. This is a BASIC computer program displayed on the monitor. You are ready to type RUN.



```
10 PRINT "TODAY IS MONDAY."
20 PRINT "WE HAVE ART."
30 GOTO 50
40 PRINT "WE HAVE ART TODAY."
50 PRINT "WE ALSO HAVE MUSIC."
60 END
```

What line will be skipped? Line _____

★★ 8. Write 36 as the product of only prime numbers. _____

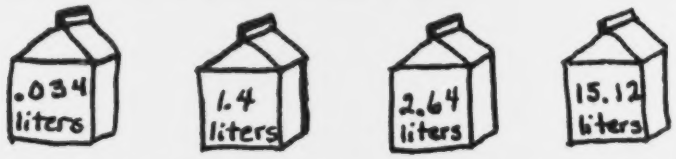
★★ 9. Write 51 as the product of only prime numbers. _____

Star Problems
Grade 5, XX

I have neither given nor received help on these problems _____

★★ 1. When you turn in your paper, your instructor will give you a problem like the following. You will have to solve the problem without paper and pencil by estimating.

Luis had four cartons of milk. Each carton contained the amount shown on the cartons below. Luis poured all four cartons into a larger container.



Which size container comes closest to holding all four cartons?

a) 10 liters
b) 15 liters
c) 20 liters
d) 25 liters

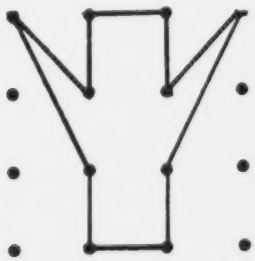
Answer later on: _____

★★ 2. A store is having a 1¢ sale on pens. The regular price of a pen is 50¢. For every pen José buys at the regular price, he can buy another one for only 1¢. How much will José have to pay if he buys 15 pens?

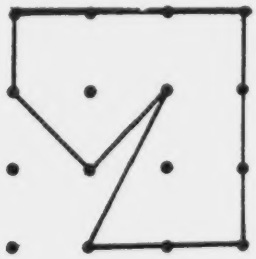
Elizabeth solved this problem and got $7.50. Is this a reasonable answer?

_____ yes _____ no

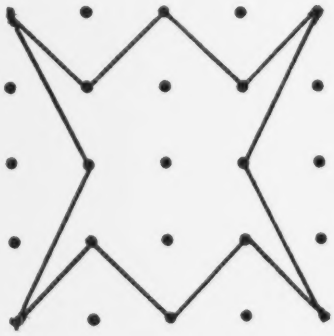
★★★ 3. Find the area of each geoboard figure below.



Area = _____



Area = _____

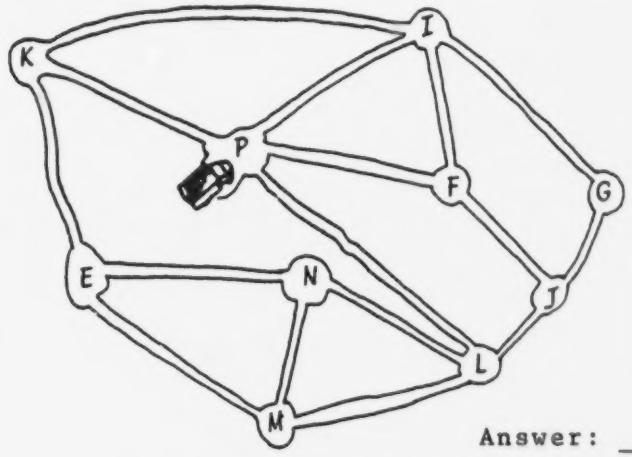


Area = _____

★★ 4. Andy, Joe, Lee, and Henry are 8, 9, 10, and 11 years old.
a. Andy is older than Lee and younger than Henry.
b. Joe is younger than Andy and older than Lee.
What is each person's age?

Answer: Andy _____ Lee _____
Joe _____ Henry _____

★★ 5. A driver of a soft drink delivery truck had to make deliveries to nine stores in nine different towns. He did not want to go over the same route twice and he did not want to go to any of the nine towns more than once. From the map below, list the towns in the order that he should make his deliveries. The soft drink plant is in town P.



Answer: _____

★★★★ 6. Design an experiment using a nickel and a penny. Your goal is to determine the probability of both coins coming up heads. Show your method for collecting and recording data. Be sure to include the results to be drawn from your data.

HINT: You should use exactly 40 trials.

Answer:

TALLY CHART

RESULTS:

From my experiment, it seems that the chance of getting 2 heads if I flip a nickel and a penny is _____.

Star Problems
Grade 5, XXI

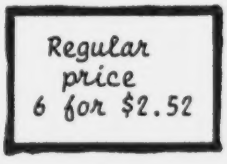
I have neither given nor received help on these problems: _____

★★ 1. 3 is a *triangle* number:

6 and 10 are the next two *triangle* numbers:

What are the next five *triangle* numbers? ___, ___, ___, ___, ___

★★★ 2. Aunt Thelma went to the market and found a sale on oranges. When you buy 6 oranges, you get ¼ off the total cost. How much did Aunt Thelma pay for 6 oranges?



Answer: _____

★★ 3. The sum of $13\frac{38}{39}$, $7\frac{16}{17}$, $4\frac{1}{9}$, and $4\frac{1}{42}$ is about

a. 28
b. 30
c. $29\frac{342}{867}$
d. 20

★ 4. Put >, <, or = between each pair of numbers.

a. 0.8 ☐ 0.800
b. 0.06 ☐ 0.6
c. 1.8 ☐ 1.432
d. 2.9 ☐ 4

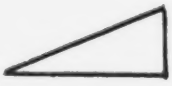
★★★★ 5. Solve for X in the equations below:

(a) $4410 \div X = 42$, so X = ____.
(b) $X \div 23 = 51$, so X = ____.
(c) $356 + X = 785$, so X = ____.
(d) $X \times 46 = 4600$, so X = ____.

★6. Choose the figure that is *similar to* the one on the left.

a.

b.

c. 

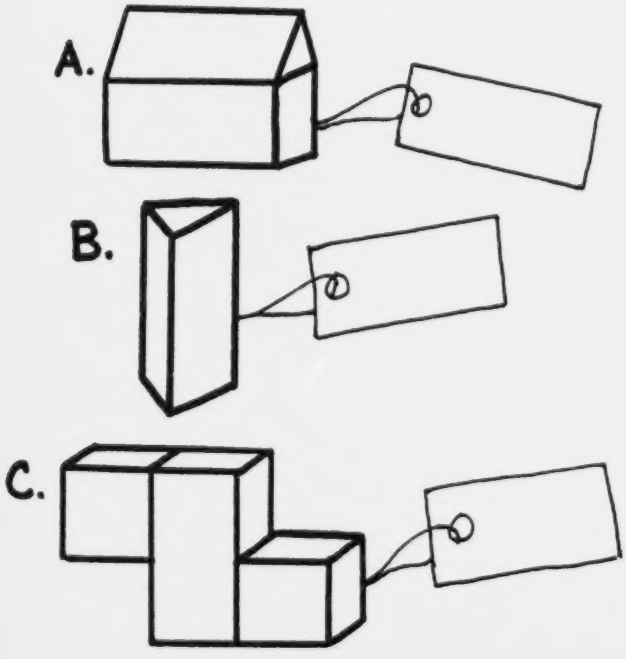
d.

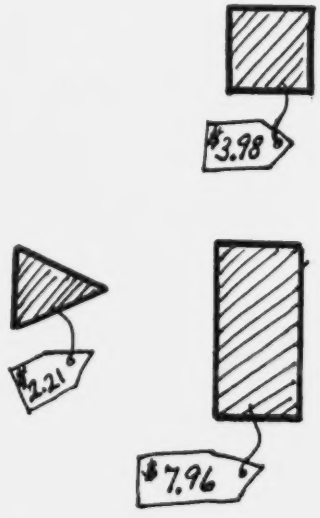
★★ 7.
$$\begin{array}{r} 5 \text{ days, } 6 \text{ hours, } 8 \text{ minutes} \\ -2 \text{ days, } 9 \text{ hours, } 9 \text{ minutes} \\ \hline \end{array}$$

★ 8. Use a calculator and start adding the whole numbers in order (add 1 + 2 + 3 + 4 + ...). What is the number you add that gets the sum above 1500?

Answer: _____

★★★½ 9. How much do these boxes cost? Compute the cost of each figure using the key. Write the total cost on the tag. Hint: All the figures are closed.

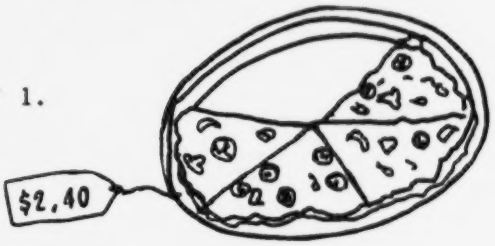




Star Problems
Grade 5, XXII

I have neither given nor received help on these problems: _____

★★ 1.



If 2/3 of a pizza sells for $2.40, how much should 1/2 of a pizza cost?

Answer: _____

★★★★ 2. The favorite sports of Shirley, Frank, Barbara and Geraldine are baseball, skating, fishing, and gymnastics. Use the clues below to find out each person's favorite sport.

1. *Shirley and Geraldine can't swim, so they can't go close to water.*
2. *No person's name begins with the same letter as his or her favorite sport.*
3. *Geraldine was the best pitcher on her team last year.*

Answer: Shirley: _____ Frank: _____ Barbara: _____

★★ 3. Mike's summer camp will last 3 weeks, and it starts June 15th. Today is April 13th. How many days will it be before he leaves, if you count today but not June 15th?

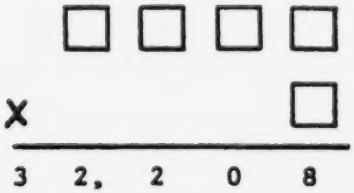
Answer: ___ days

★★★ 4. Last month Bob made 9 calls to Miami that totaled 43 minutes, and 5 calls to New York that totaled 35 minutes. All calls were made on the weekend. Using the chart below, how much would these calls cost?

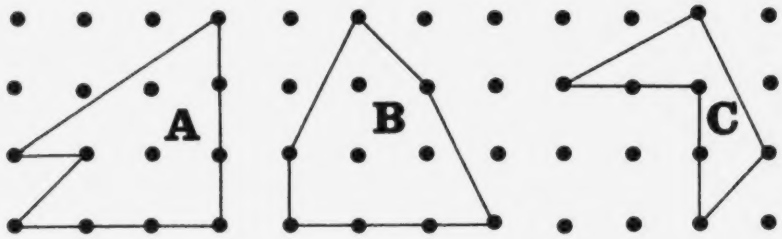
	WEEKEND TELEPHONE DISCOUNT RATES	
	First minute	Each additional minute
To Miami	27¢	18¢
To New York	28¢	20¢

Answer: _____

★★ 5. The missing digits for this problem are 0, 2, 4, 6 and 8. Put them in their correct boxes.



★★★ 6. Write the area of the figures below. The dots are 1 cm apart.



Area = ___ cm^2 Area = ___ cm^2 Area = ___ cm^2

★★★ 7. Bubble in the best choice below for the perimeter of each of the figures above.

Figure A:	Figure B:	Figure C:
○ 12 cm	○ 8 cm	○ 6 cm
○ 14 cm	○ 10 cm	○ 8 cm
○ 16 cm	○ 12 cm	○ 10 cm

★★★★ 8. *Base 2* is a numeration system that uses only 0 and 1 to tell how many things have been counted. The place values in *base 2* are found by grouping things in two's instead of in ten's. The first few place values for *base 2* are shown below:

..... EIGHT'S FOUR'S TWO'S UNITS ⇦

So a *base 2* numeral like *1011* would have a value of 8 + 0 + 2 + 1, or **eleven**, using the place-value chart above.

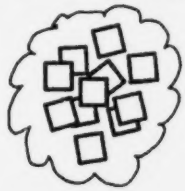
Write the values for the following *base 2* numerals. The first is done for you.

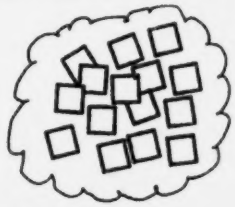
(a) 1011 = eleven (c) 1001 = _____ (e) 100 = _____

(b) 111 = _____ (d) 11 = _____ (f) 1101 = _____

★★★ 9. See if you can work backwards, using this new system of naming numbers. Write the *base 2* name for each collection below. The first is done for you.

111


_____



_____

Star Problems
Grade 5, XXIII

I have neither given nor received help on these problems: _____

★ 1. Draw an *equilateral triangle* on a sheet of scratch paper. What is the word name for an angle in this type of triangle? Circle it below.

a. acute angle b. obtuse angle c. right angle

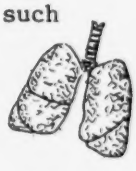
★★ 2. How many pairs of counting numbers, when added together, give the sum 89? (Hint: use the chart below to make your work easier.)

Answer: _____

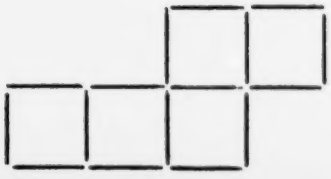
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

★★ 3. On the average, human beings breathe 984 times each hour. Circle the best estimate below of the number of breaths per week, on the average, for such a human being.

a. 200,000 b. 165,312 c. 151,200 d. 168,000



★★★ 4. Draw arrows to show how to rearrange exactly 2 of these toothpicks so that you'll have 4 squares instead of 5. Each square is to be the same size as the ones shown.



★★ 5. What is the missing dividend for: 6) 780780780780 r. 5

Answer: _____

★★★★ 6. On September 13, 1922, the temperature reached 136.4° F. in Al 'Aziziyah, Libya. On August 24, 1960, the temperature plunged to -126.9°F. in Vostok, Antarctica. According to the Guinness Book of World Records, these are the hottest and coldest temperatures recorded on earth. What is the difference between these two temperatures?

Answer: There is a difference of _____° F. in these temperatures.

★★ 7. Which has a sum that's an *even* number, the *even* numbers less than 50, or the *odd* numbers less than 50?

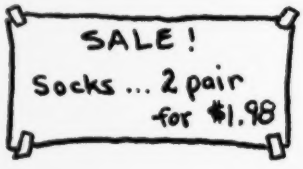
Answer: _____

★★ 8. Which has a sum that's an *even* number, the *even* numbers less than 49, or the *odd* numbers less than 49?

Answer: _____

★★★ 9. How much money will I get back as change from a $5 bill if I buy three pairs of socks selling as advertised below. (Pretend that there's no sales tax.)

Answer: _____



★★★ 10. Five *consecutive* whole numbers ("consecutive" numbers are like 2, 3, 4, 5, ...) add up to 225. What are the numbers?

Answer: ____, ____, ____, ____, ____

★ 11. Your seat in the classroom is in a position so that you cannot see the clock directly. But you <u>can</u> see the clock by looking in a mirror on the wall.

One day you look in the mirror and saw the clock to the right. What time was it?

Answer: _____

Star Problems
Grade 5, XXIV

I have neither given nor received help on these problems: _____

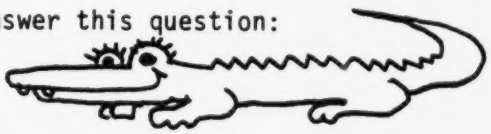
★ 1. How much would you save by ordering "J" to the right (9 PC.THRIFT), than by ordering 3 of the "H's" (COMBO)? You'd get the same amount of chicken, but the larger size is supposed to be cheaper!

Answer: I'd save _____.

★★ 2. An alligator nest usually measures about 8 feet across the center and has between 30 and 60 eggs in it. If such a nest has 46 eggs in it and half of them hatch, how many baby alligators would there be?

Circle the numbers you would not need to answer this question:

30 60 46 8



★★ 3.

According to the map to the left, how far would you drive if you went from Pensacola to Jacksonville to Tampa to Miami?

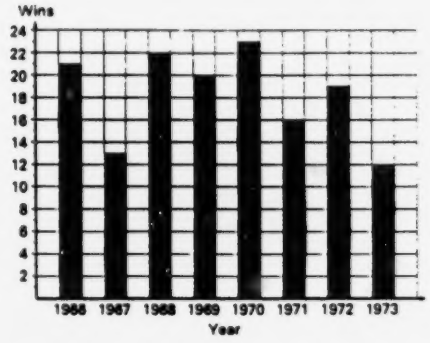
Bubble in your answer:

- ○ About 600 miles
- ○ About 700 miles
- ○ About 800 miles
- ○ About 900 miles

★ 4. $6\overline{)1414681414680141468001414680004}$

★★★ 5. Find the Least Commom Multiple of 64 and 48. Answer: *The least common multiple of 64 and 48 is* _____.

★★ 6. The bar graph to the right illustrates the number of wins for Joe's baseball team from 1966 to 1973.



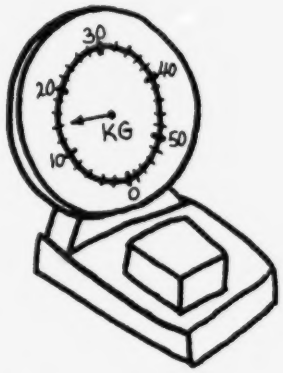
a. In which year did Joe's team win exactly 22 games? _____

b. In which year did Joe's team win the fewest games? _____

c. In which year did Joe's team win the most games? _____

d. How many games has Joe's team won in the number of years they have played? _____

★ 7. Mary is mailing a birthday package to her Aunt Jane. How much does her package weigh? _____

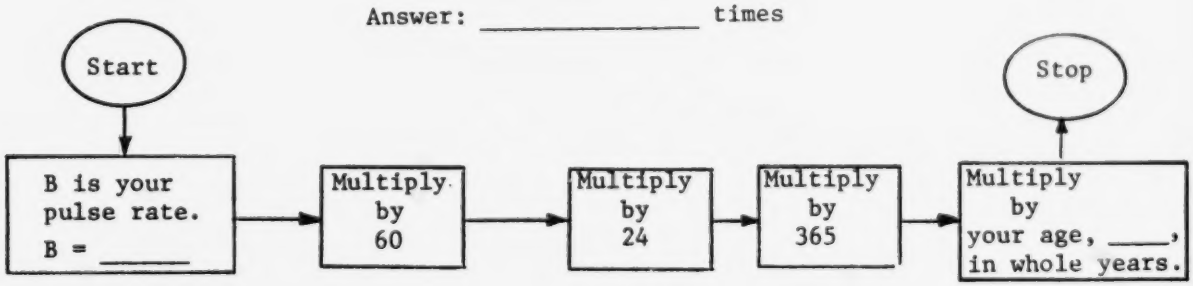


★★ 8. Mary had been earning $3.25 a week for her allowance. This year she got a raise to $3.50 a week. If there are 52 weeks in a year, how much more will she make this year than she made last year?

Answer: She'll make _____more this year than last year.

★★★ 9. Take your pulse when you are at rest. (A good time is in the morning when you first wake up.) This will be an approximate number of times your heart has beat each minute you have been alive. Put this number (B = your heartbeat) and your age into the appropriate places below. Use a calculator to go through the flow chart to determine about how many times your heart had contracted by your last birthday.

Answer: _____ times

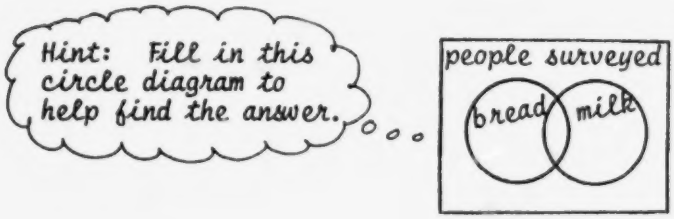


Star Problems
Grade 5, XXV

I have neither given nor received help on these problems: _____

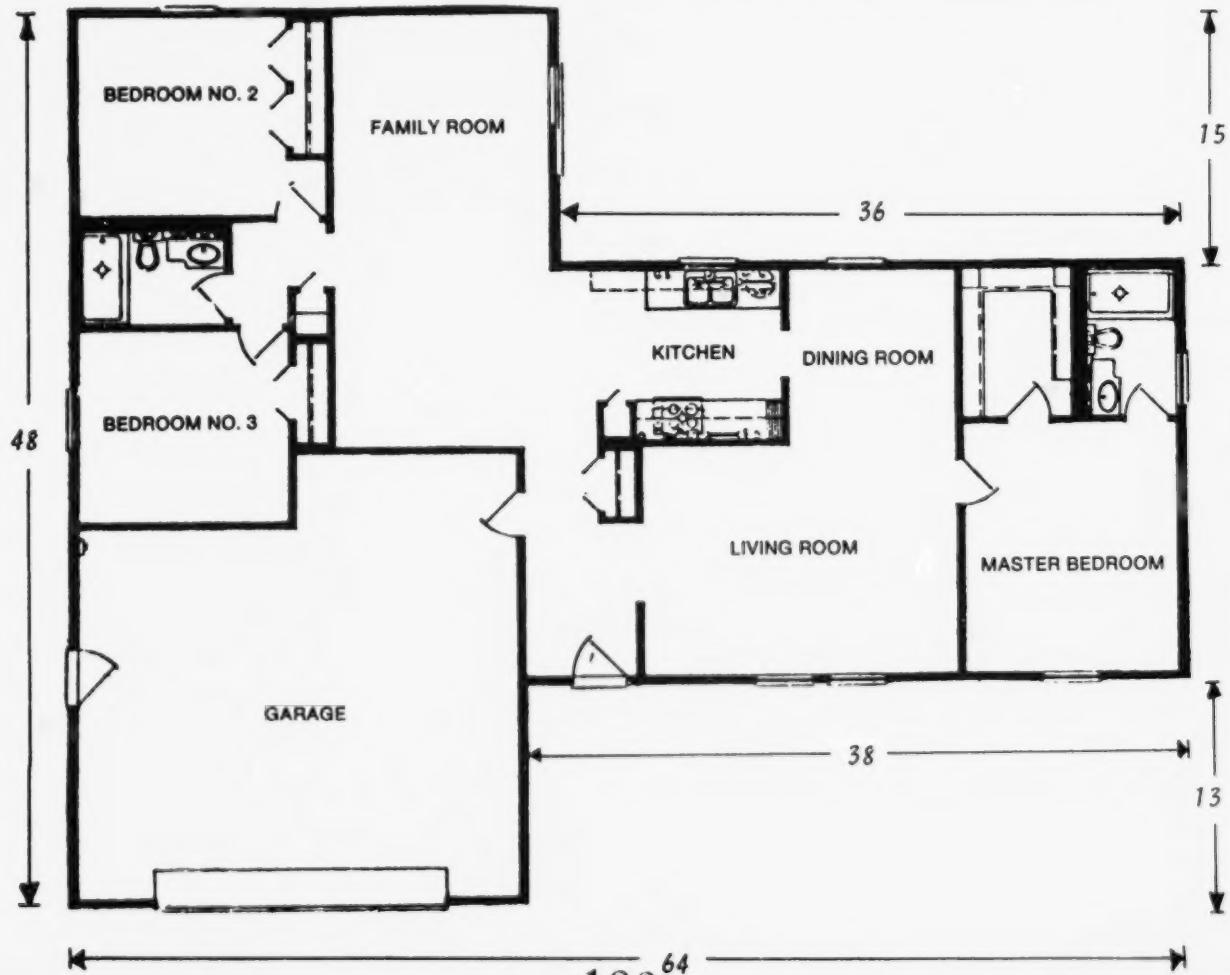
★★★ 1. Of 50 shoppers surveyed, 32 bought milk; 20 bought bread; 12 bought both bread and milk. How many bought neither bread nor milk?

Answer: _____



★★★ 2. Compute the approximate area of the house shown below, counting the garage. (The numbers shown are "feet".)

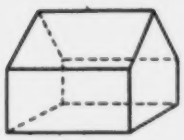
Answer: The house is _____ square feet.



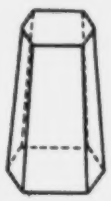
★ 3. Circle the coin below that is different from the others.

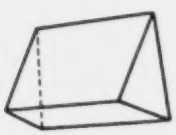
★★ 4. *Polyhedra* have special word names, depending on the number of *faces*. Find the word name for each polyhedron below from the chart, and write its name on the line beneath the figure. The first one is started for you.

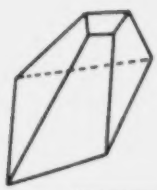
Name	Number of faces
Tetrahedron	4
Pentahedron	5
Hexahedron	6
Heptahedron	7
Octahedron	8
Decahedron	10
Dodecahedron	12
Icosahedron	20

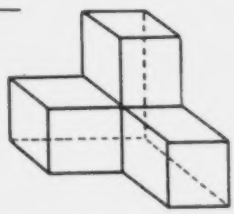


hepta









★★★★ 5. Solve for X:

a. (X x 14) + 3 = 143; X = ____

b. (X÷8) - 5 = 95; X = ____

★★ 6. $\frac{3}{4} + \frac{1}{2} + \frac{5}{6} - \frac{1}{3} + \frac{7}{12} = \square$

★★★ 7. Which pair of numbers whose sum is 35 have the largest product?

Answer: ___ and ___

Star Problems
Grade 5, XXVI

I have neither given nor received help on these problems: _____

★★★★ 1. Clark, Jones, Morgan and Sills are four people whose occupations are butcher, druggist, grocer, and policeman, but not necessarily in that order. Use the following clues to find out each person's occupation.

a. *Neither Morgan nor Sills has met the druggist.*

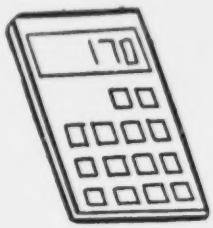
b. *Morgan often plays basketball with the grocer and policeman.*

c. *Jones makes more money than the policeman, who makes more money than the druggist.*

Answer: Clark is the _____; Jones is the _____;

Morgan is the _____; Sills is the _____.

★★ 2. Mark was calculating his average for the scores he made on his spelling tests last grading period. On each test, he had 20 words to spell, and his test grade was written at the top of the paper as a percent. When he averaged all of these percents, he got the answer shown to the right.



Do you think this is a reasonable answer, or do you think he probably made a mistake? Why?

Answer: _____

★★ 3. Find the whole numbers X that make this a true statement: $X - 5 < 7$

Answer: X could be any of these numbers: _____

★★ 4. Write in the correct digits for this division problem:

$$\begin{array}{r} \square\square4 \\ \square\square\overline{)504} \\ \square\square \\ \hline \square4 \\ 84 \\ \hline 0 \end{array}$$

★★ 5. If Girl Scout cookies sell for $2 a box, how much money did Markita bring in during her 6 years as "top salesperson?"

Answer: _____

NEW YORK – Markita Andrews is more than 100 times better than the average Girl Scout – when it comes to selling cookies.

Just how good is Markita?

Well, in six years, she's sold 15,500 boxes of cookies during annual drives – 8,000 boxes alone in 1984. And in this year's three-week-long sales drive that ended Monday, Marita sold 2,196 boxes of cookies.

In addition, th[illegible]-year-old ha[illegible] old nearly 10[illegible] boxes wh[illegible] e deliv[illegible] colle[illegible]

★★★ 6. The *Greatest Common Factor* (GCF) of two numbers is the largest number that divides both of them, with no remainder. Find the *Greatest Common Factor* of the pairs of numbers below. (The first is done for you.)

GCF (12, 8) = 4

GCF (20, 15) = ____

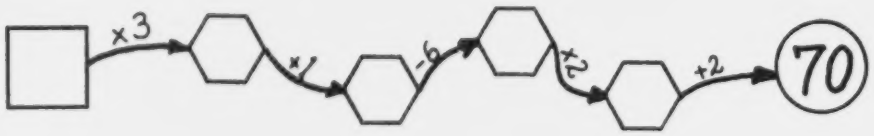
GCF (30, 24) = ____

GCF (30, 45) = ____

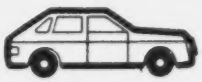
GCF (30, 60) = ____

GCF (20, 50) = ____

★★★ 7. What number goes in the starting box to give the final answer?



★ 8. Circle the best estimate below for the height of a regular sized automobile, like the one to the right.



a. 1 meter

b. 1.5 meters

c. 2 meters

d. 2.5 meters

★★ 9.

3 WEEKS, 4 DAYS, 13 HOURS, 21 MINUTES

- 1 WEEK, 5 DAYS, 18 HOURS, 30 MINUTES

☐ WEEK ☐ DAYS ☐ HOURS ☐ MINUTES

Star Problems
Grade 5, XXVII

I have neither given nor received help on these problems: _____

★ 1. A *prime number* is a whole number that has exactly 2 factors--itself and 1. The first 2 prime numbers are 2 and 3. List the first eight prime numbers:

Answer: The first eight prime numbers are: 2, 3, _____

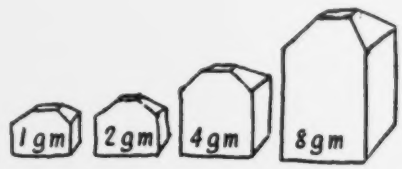
★★ 2. A man named Goldbach once stated that any even number larger than 2 could be written as the sum of 2 prime numbers. (For example, 8 can be written as 5 + 3, and both 5 and 3 are "prime numbers.") Show that Goldbach was correct for the even numbers less than 34, by writing them as the sum of two primes.

Answer:

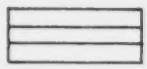
4 = _____	14 = _____	24 = _____
6 = _____	16 = _____	26 = _____
8 = _____	18 = _____	28 = _____
10 = _____	20 = _____	30 = _____
12 = _____	22 = _____	32 = _____

★★★ 3. You have a 1-gram weight, a 2-gram weight, a 4-gram weight, and an 8-gram weight. How many different, *exact* weighings could you make, using your weights by themselves and in combination with your other weights?

(For example, you could make an exact weighing of 5 grams, using your 1- and 4-gram weights.)



Answer: I could make ____ weighings.

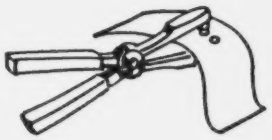
★★★ 4. There are 6 rectangles in  . How many rectangles are in ?

Answer: ____ rectangles.

★★★ 5. 32 of the 56 students in 5th grade were in Scouts. 38 of the students were in sports. If 24 students were in both Scouts and sports, how many students were not in either activity?

Answer: ____ students

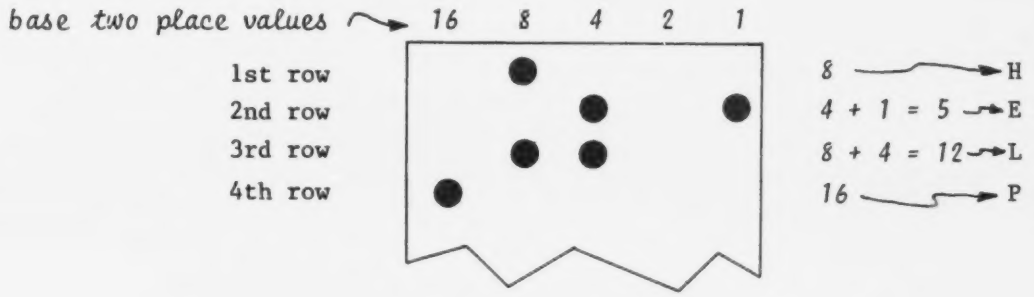
★★★★ 6. Here is a SECRET CODE made by punching holes in paper tape. This is a *binary code* since it uses the "base two" numeration system to name letters of the alphabet.



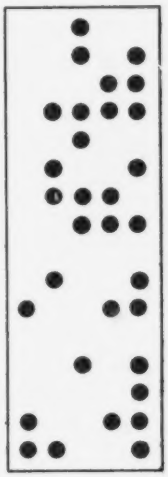
First we give the letters of the alphabet their correct numbers.

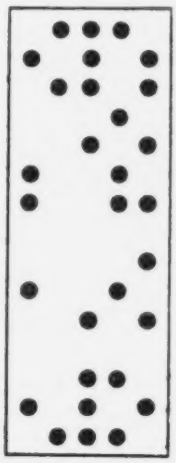
A	B	C	D	E	F	G	H	T	U	V	X	X	Y	Z
1	2	3	4	5	6	7	8	20	21	22	23	24	25	26

Each letter is shown as a row of holes--the code for the holes is determined by the *base two* place values. Look at how "help" would appear on the tape:



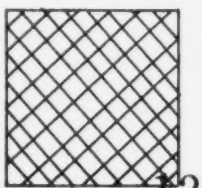
For your stars, try decoding these messages:





Message 1: _____ Message 2: _____

★★ 7. A *square inch* looks like this:



Bubble in the best estimate to the right of the area of this sheet of paper.

- ○ 50 sq. inches
- ○ 90 sq. inches
- ○ 125 sq. inches
- ○ 150 sq. inches

Star Problems
Grade 5, XXVIII

I have neither given nor received help on these problems: _____

★★★★ 1. Allen, Barbara, Christy, and Dan are good in 4 different subjects at school--dancing, singing, writing, and painting. Use these clues to find out which student is good in which subject.

a. Barbara and Christy were in the audience when the singer performed in the school play.

b. Allen and the writer have had their portraits made by the painter.

c. The writer has written a story about her boyfriend.

d. One student's name begins with the same letter as the subject he or she is best at.

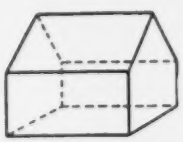
e. Christy hates all boys.

Answer: Allen is the _____; Barbara is the _____; Christy is the _____

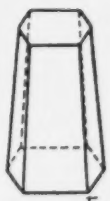
★★ 2. Manny used a calculator to find out how much money he would have if he started with a penny in the bank on September 1, and doubled the amount each day until September 30th. He was surprised at his answer--the account should have over $5,000,000 in it on September 30th! Is his answer logical, or did he make a mistake somewhere on the calculator?

Answer: _____

★★★ 3. For each *polyhedron* below, write the number of *faces*, the number of *edges*, and the number of *vertices* (points). The first one is done for you, but the last one might be a real challenge!

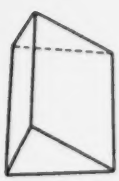


F = 7
E = 15
V = 10

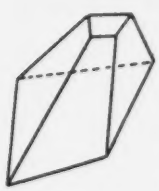


F = ___
E = ___
V = ___

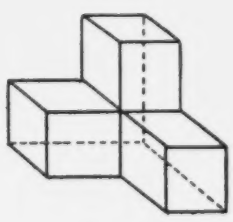
F = ___
E = ___
V = ___



F = ___
E = ___
V = ___

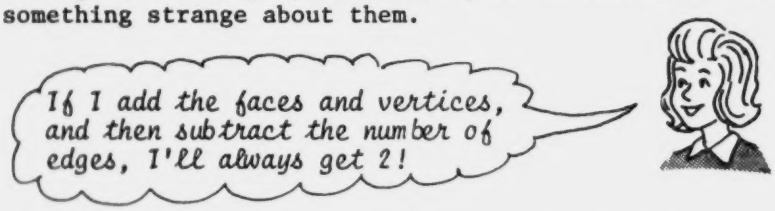


F = ___
E = ___
V = ___



F = ___
E = ___
V = ___

★★★ 4. Marsha was working with some polyhedra last year in class, and thought she noticed something strange about them.



Would Marsha's "rule" work for the polyhedra on the other side of this worksheet?

Answer: _____

★★★★ 5. Solve for X:

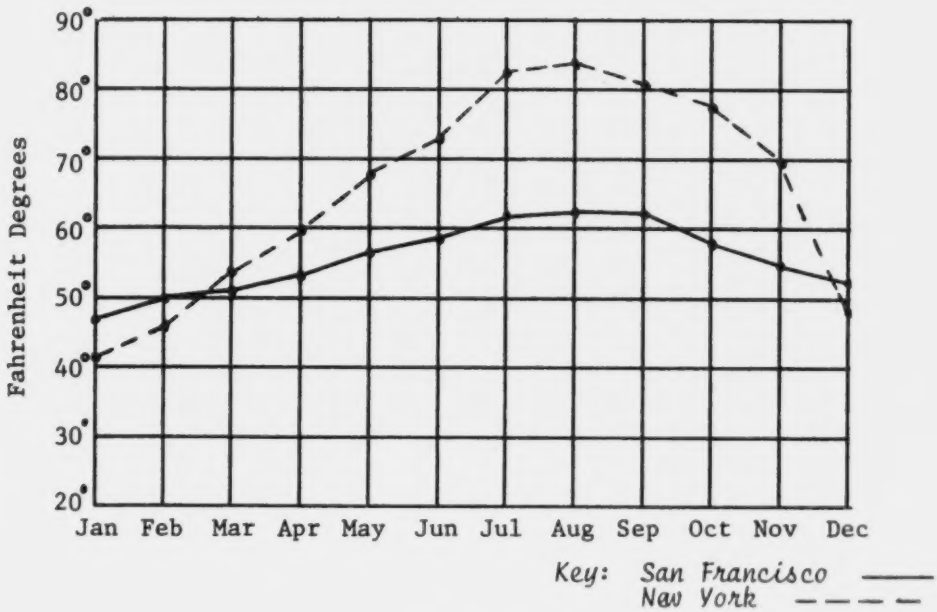
a. $33 \times X = 9900$; $X =$ _____

b. $X \div 42 = 28$; $X =$ _____

c. $X \times 26 = 910$; $X =$ ____

d. $2210 \div X = 65$; $X =$ ____

★★★ 6. The *line graph* below shows the average monthly temperatures for two large cities in the United States. Answer the questions below the graph.



a. In April, the average temperature in San Francisco is about ____° F. In New York in that same month, it would be about ____° F.

b. In which city would you probably run your air conditioner the most, during the summer? _____

c. In which city would you probably run your heater the most, during the winter months? _____

TEACHER COMMENTARY

(Intermediate)

STUDENT PERFORMANCE STANDARDS OF EXCELLENCE

IN

MATHEMATICS

1984-85 through 1988-89

Division of Public Schools
Florida Department of Education

STANDARDS	SKILLS - The student will:		GRADE LEVEL(S)
A. THE STUDENT WILL APPLY PROBLEM-SOLVING TECHNIQUES.	1001.	Solve word problems requiring multi-step computation.	3 5
	1002.	Solve problems appropriate for a table, chart, or list organizational plan.	3 5
	1003.	Solve problems appropriate for drawing a diagram.	3 5
	1004.	Solve problems appropriate for a guess (or estimate)-check-revise technique.	3 5
	1005.	Solve problems appropriate for a working backwards technique.	3 5
	1006.	Solve problems requiring visual discrimination.	3 5
	1007.	Solve problems involving sequential numeric and geometric patterns.	3 5
	1008.	Check the results of a problem-solving attempt in terms of the original problem.	3 5
	1009.	Solve word problems that include extraneous information.	5
	1010.	Form tentative hypotheses in problem-solving situations.	5
B. THE STUDENT WILL APPLY MATHEMATICS TO EVERYDAY, REAL-WORLD SITUATIONS.	1017.	Compute the value of a set of coins and bills, and write it in decimal notation using the dollar sign.	3
	1018.	Compute the total cost of several items including tax.	3 5
	1019.	Compute the change which would be received in making purchases.	3 5
	1020.	Solve problems related to managing personal income.	3 5

B. (continued) THE STUDENT WILL APPLY MATHEMATICS TO EVERYDAY, REAL-WORLD SITUATIONS.	1021.	Solve problems related to managing personal time.	3	5
	1022.	Solve problems which require interpreting time schedules from a chart.		5
	1023.	Compute the sale price of an item discounted by a fraction.		5
C. THE STUDENT WILL DEMONSTRATE ESTIMATION AND APPROXIMATION PROCEDURES.	1029.	Estimate the solution to computational exercises involving whole numbers.	3	5
	1030.	Estimate the solution to money problems.	3	5
	1031.	Estimate linear measurements.		5
	1032.	Round any decimal number less than 1, with up to 3 decimal places, to the nearest designated place.		5
	1033.	Estimate the solution to computational exercises involving + and - of mixed decimal numbers.		5
	1034.	Estimate the solution to computational exercises involving + and - of mixed fraction numbers.		5
	1035.	Give reasonable responses based on personal knowledge of a situation rather than rounding and computing.		5
	1036.	Estimate any appropriate measure (length, area), given geometric figures of two dimensions.		5
	1037.	Determine whether or not a proposed answer is reasonable in a given problem situation.		5
D. THE STUDENT WILL PERFORM MATHEMATICAL COMPUTATIONS.	1046.	Determine the relationship (>, <, =) between expressions using + and - of whole numbers.	3	
	1047.	Add or subtract multi-digit whole numbers, using standard algorithms.	3	

D.	(continued) THE STUDENT WILL PERFORM MATHEMATICAL COMPUTATIONS.	1048.	Add or subtract multi-digit whole numbers, using alternative methods.	3
		1049.	Multiply or divide a 2- or more digit whole number by a 1-digit number.	3
		1050.	Solve computational puzzles for whole numbers that demonstrate understanding of, and ingenuity with, computational principles.	3 5
		1051.	Determine the relationship (>, <, =), between proper fractions.	3 5
		1052.	Multiply or divide multi-digit whole numbers, using standard algorithms.	5
		1053.	Multiply or divide multi-digit whole numbers, using alternative methods.	5
		1054.	Compute sums, differences, products and quotients in exercises that involve parentheses.	5
		1055.	Add or subtract two mixed numbers.	5
		1056.	Multiply 2 decimal numbers.	5
E.	THE STUDENT WILL USE MATHEMATICAL SYMBOLS AND CONCEPTS TO SOLVE PROBLEMS WITHIN MATHEMATICAL SYSTEMS.	1072.	Write the standard base-ten numerals for an expanded numeral.	3
		1073.	Determine whether any given whole number is odd or even.	3
		1074.	Solve simple equations of the form $a \pm x = b$ for x a whole number.	3 5
		1075.	Rename a base-ten numeral as a base-two numeral, or conversely.	5
		1076.	Classify the sum, difference, product or quotient of odd or even numbers as odd or even.	5
		1077.	Solve equations of the form $a \cdot x = b$ or $x \div a = b$, for x a whole number.	5

E.	(continued) THE STUDENT WILL USE MATHEMATICAL SYMBOLS AND CONCEPTS TO SOLVE PROBLEMS WITHIN MATHEMATICAL SYSTEMS.	1078.	Solve simple algebraic inequalities involving + and -.	5
		1079.	Determine if a given number is prime or composite.	5
		1080.	Write composite numbers as the product of prime numbers.	5
		1081.	Determine the Greatest Common Factor (Divisor) and Least Common Multiple for 2 whole numbers.	5
F.	THE STUDENT WILL RECOGNIZE AND APPLY GEOMETRIC CONCEPTS.	1107.	Identify fundamental geometric figures.	3 5
		1108.	Recognize fundamental geometric concepts.	3 5
		1109.	Classify geometric figures.	3 5
		1110.	Recognize and apply topological concepts.	3 5
		1111.	Perform basic line and angle constructions.	5
G.	THE STUDENT WILL RECOGNIZE AND APPLY MEASUREMENT CONCEPTS.	1122.	Convert within given units of measuring time.	3
		1123.	Apply the concept of measuring elapsed time.	3 5
		1124.	Apply the concept of measuring temperature.	3 5
		1125.	Apply the concept of measuring length.	3 5
		1126.	Apply the concept of measuring area.	3 5
		1127.	Apply the concept of measuring volume and/or surface area.	3 5
		1128.	Apply the concept of measuring mass.	3 5
		1129.	Convert given measures of mass to equivalent answers.	5
		1130.	Convert given measures of length to equivalent answers.	5

G.	(continued) THE STUDENT WILL RECOGNIZE AND APPLY MEASUREMENT CONCEPTS.	1131.	Determine the degree measure of an angle.	5
H.	THE STUDENT WILL COLLECT DATA AND CONSTRUCT, INTERPRET AND DRAW CONCLUSIONS FROM DESCRIPTIVE TABLES, CHARTS AND GRAPHS.	1144.	Read, interpret and construct pictographs.	3
		1145.	Read, interpret and construct bar graphs, line graphs and tables.	3
		1146.	Graph ordered pairs of numbers using a Cartesian coordinate system.	3 5
		1147.	Collect, organize and represent data using an appropriate pictograph, bar or line graph, or table.	3 5
		1148.	Read, interpret and construct circle graphs.	5
		1149.	Predict specific outcomes from a set of data, given that the present trend continues.	5
		1150.	Read and determine relationships represented by multiple line and bar graphs.	5
I.	THE STUDENT WILL RECOGNIZE AND APPLY THE CONCEPTS OF PROBABILITY AND STATISTICS.	1153.	Collect and record data for a simple probability experiment.	3
		1154.	Determine measures of central tendency for a set of data.	3 5
		1155.	Use common fractions to describe the probability of an event.	5
		1156.	Use common fractions to describe the probability of the complement of an event.	5
		1157.	Design a simple experiment, collect data and draw appropriate conclusions.	5

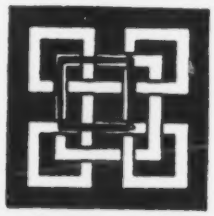
J.	**THE STUDENT WILL DEMONSTRATE KNOWLEDGE OF CALCULATORS AND COMPUTERS AS APPLIED TO MATHEMATICS.**	1166.	Organize, complete, or follow the logic of a flowchart for a daily activity.	3 5
		1167.	Perform the computation involved in a mathematical flowchart with specific input.	3 5
		1168.	Use a calculator to perform computations.	3 5
		1169.	Determine whether an answer on a calculator or computer is reasonable for the given problem.	3 5
		1170.	Demonstrate knowledge of calculator and computer input and output displays.	5

TEACHER COMMENTARY

FOR

GRADE 4 WORKSHEETS

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1003	This problem is designed to introduce students to Venn (or circle) diagrams. Later on in the year, these problems will become more abstract, and in 5th grade, problems will be given for which they draw the diagram themselves. In your small group session, put a similar problem on the board and discuss all 4 regions involved (counting the kids in the class, not in a circle, as another region). ANSWER: (a) 6 (b) 7 (c) 2 (d) 16
2	1035 1169	In your session, go over in a humorous vein how people frequently misuse a decimal point with money symbols. If they look around, they'll see marquee signs that advertise a hamburger, fries and coke for $199, or a pack of gum for .39¢. You can go into as much of a "decimal point" explanation as is appropriate for the students, but at least point out that "whatever is to the left is a whole number, and whatever is to the right is a fraction." Put this together with either "$" or "¢" to get reasonable, or nonsensical, prices. ANSWER: (d)
3	1006	This problem is interesting for students, if they listen to other students' solutions. Some will say 10, counting only the most obvious. Some will say 14, counting these four too:  Some might even say that they got 28, by counting squares formed both by the inside and the outside edge of the white line. ANSWER: Accept 14 or 28.

4 1005

Ask for two different ways to solve this problem, and expect these approaches:

(a) I counted 8 pieces in each pie, and did (8 x 3) + 5.

(b) I knew there were 8 pieces in each pie, and that there were 8 x 5 pieces altogether. I could see 11 left, so I found (8 x 5) - 11.

ANSWER: 29

5 1006

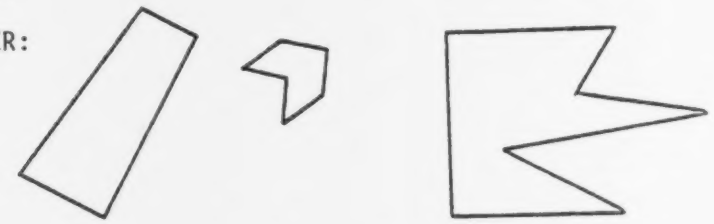
Suggest that students who are having trouble look at the shape surrounding each number.

ANSWER: 8 (or ⌊) for all 4 answers

6 1109

In Worksheet XV of Grade 3, students are introduced to simple closed curves. You will want to review this briefly for them, showing examples of non-simple closed curves (both curves that "cross over" themselves, and those that aren't "closed"). Then by example show several polygons and non-polygons on the board.

ANSWER:



7 1002

Suggest that students list the days of the week, and count from the 9th starting on a Tuesday.

ANSWER: Saturday

8 1004
1002

If students have trouble have them try listing pairs of numbers that sum to 60, till they "close in" on a pair with a difference of 24. In your session, you might proceed with this start:

(50,10) [No! Difference is 40.]
(40,20) [No! Difference is 20.]
(45,15) [No! Difference is 30.]
etc.

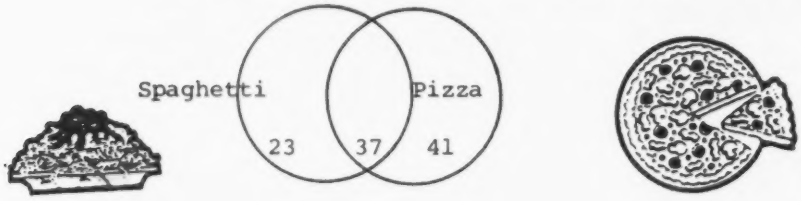
ANSWER: 42 and 18

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1003	This problem is laying the foundation for understanding Venn Diagrams, a graphical method of solving certain types of problems. You will need to extend the problem in the classroom over the year, leading into problems like:

Al was taking orders at Pizza Palace. Use the circle diagram below to answer the questions.

How many have ordered pizzas?_____
How many have ordered spaghetti?_____
How many have ordered pizza and spaghetti?_____



In later years, the students will be asked to solve such problems by drawing the Venn Diagram themselves.

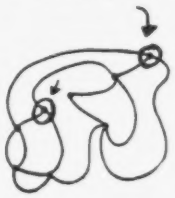
ANSWER: Jo
Mary, Bill, Sam
Jim, Jo

2	1004	In your small-group session, encourage students to begin their "guess-check-revise" procedure in an organized fashion. For example, they might start by trying to have either a half-dollar (the largest coin) or a penny (the smallest) in the collection.

ANSWER: Several solutions are possible. For example,

(a) 50¢, 10¢, 10¢, 10¢, 10¢, 10¢
(b) 50¢, 25¢, 5¢, 5¢, 5¢, 10¢
(c) 25¢, 25¢, 25¢, 10¢, 10¢, 5¢

all satisfy the conditions.

3	1034	In your small-group session, take several problems similar to these for the students to solve. Be sure you pick fractions that would be difficult to handle computationally because of the denominator, but which are intuitively "close to" zero or one. This encourages students to estimate, rather than compute and round off the answer. ANSWER: c, b
4	1004 1050 1054	This problem involves computational ingenuity, reinforcing problem solving by the guess-check-revise technique. Students might be encouraged to use parenthesis, as shown above, to clear up any misconceptions about which operations to use first. If they don't use parenthesis, you can assume they mean to do the steps in order, left-to-right as if they were following a flowchart. But if this is the case, later on (in algebra) they'll learn this isn't true with equations. ANSWER: [(10+9+1)÷5]-3=1 (answers may vary)
5	1110	This problem deals with topological concepts. A network can be traced if it has 0 or 2 "odd vertices." The 2 vertices that are circled are the only "odd vertices" in the network, and hence can be used as the starting or ending points in tracing the figure. ANSWER: 
6,8	1168 1050	Hopefully students will use a calculator to solve problem 6, and then notice that they can simply "annex a zero" to this answer to get problem 8 correct. Go over a similar problem in the small-group session, using a calculator first and then multiplying by 100 or 1000, by hand, to get the other answer. ANSWERS: 6. 362,880 8. 3,628,800
7	1006	Encourage students to count the squares in an organized fashion - smallest-to-largest, or vice-versa. You might take a similar problem in your small-group session. ANSWER: 6

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1018 1019 1001	In your small-group session, have a child explain that you first add to get the total spent, and then find the tax. Go over how to find the tax on amounts like \$68.37 or \$35.20, using two steps (calculating 5¢ per dollar times the dollar amount, and using the tax chart for the rest). ANSWER: i. \$82.79 ii. \$17.21
2	1050	Go over a similar problem in the small-group session, stressing a "guess-check-revise" method modified by deductive reasoning when possible. ANSWER: 4[5]6 8 5[9]6 +[5]9 4[7]
3	1154	The numeral "3" in this problem may be a distractor for some students. In your session, go over briefly the process for finding the average, and give an example using other numbers than in this problem. ANSWER: 4
4,5	1128 1129	Problem 4 is a straight-forward scale reading, except that the pointer is between 600 and 700. For problem 5, students may need help recalling that 1 kilogram = 1000 grams. ANSWERS: 4. 650 5. 650,000

6 1004

Since the students do not have algebraic techniques at their disposal yet, they solve this problem by "guess-check-revise." They would start by guessing the age of one of the girls--the youngest works best, but they could start with any girl--compute the age of the other two girls from that. Then they would add the three resulting ages, and see if they got 30. If not, they'd revise their initial guess, using the knowledge they gained from the first one to guess either higher or lower. Start them off on this process in class, guessing Pam to be 1, then 2, then 3. Stop here.

ANSWER: 15, 5, 10

7 1004

This problem is also solved by "guess-check-revise." Students guess a number for the box, and check out the flowchart to see if they're correct. Then they revise their guess. Start them off on this process by guessing 1, checking, and stopping to let them finish at home.

ANSWER: 4

8 1148

The intent of this problem is to give children exposure to circle graphs. They should realize that the "most popular method of transportation" will be the one with the largest area; in the second part, students should have an intuitive feel for these particular percentages--50% is 1/2, 25% is 1/4, etc.--and be able to check on the fractions visually. Go over a similar graph in your small-group session.

ANSWERS: (a) car pool
(b) 25%

9 1007

This problem involves noticing a pattern in the first two problems, and conjecturing an answer based on this pattern for the question mark. The pattern for this first problem is:

add 1st two numbers, subtract 3rd

The pattern for the second problem is:

multiply 1st two numbers, divide by 3rd

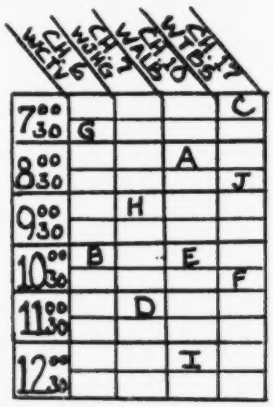
ANSWER: 9, 2

10 1144

In your small-group session, ask several questions which will bring out the use of the key, and the use of partial symbols.

ANSWERS: 8, 13

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1002	This problem reinforces solving a problem by "making a list." All the different combinations can simply be listed, and then counted. Start off the list for them, in your small-group session. 4572 4527 4752 4725 gets all the ones that start with 4257 4 as the first digit. Then move to 4275 the other "first digits." ANSWER: 24
2	1022	The essence of this problem is to have students solve a "real world" problem involving reading time schedules on a chart. The only difference in this and the usual way of presenting this type of problem is that the times and programs are given, and the student has to insert them in the right place on the chart. In your small-group session, place only one of the letters for the students. ANSWER: 
3	1076	In this problem, students begin to classify a string of numerical computations as having either odd or even answers. Hopefully the students will not do all of the computation indicated, but just enough to see what the last digit would be, and therefore if the answer is odd or even. In your small-group session, take several similar examples for the students to solve. ANSWER: even, odd, even, odd

4 1029
1001

This problem has students compute an approximate answer to a "real world" problem. They might do this by multiplying 72 x 60 x 24 x 30, and rounding off the answer. Or they might round off 72 to 70 to begin with, and compute in that fashion. In discussing this problem with the students, point out that this is a case in which an approximate answer is the only reasonable type to give--it's impossible to compute exactly how many times a person's heart beats in a month!

ANSWER: D 3 million times

5 1073

This problem might be solved by students by "keying into" one of the three digits, and manipulating the others till they find the answer. The hundreds digit has to be an even number since it's twice the tens digit; the ones digit must be an odd number for the whole numeral to be odd. The only situation like this, with the sum of the digits being 9, is:

ANSWER: 423

6 1127

Have a Rubik's cube in class, and be sure the students understand that they're after the area of the 6 surfaces - the "surface area," as it will be called from now on.

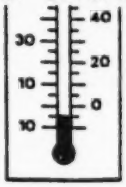
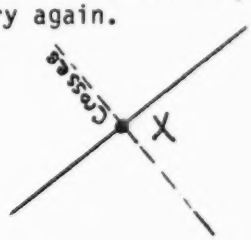
ANSWER: 54

7 1127

This problem reinforces the concept of "volume." The answer in each case can be found by counting the cubes that are visible, and those that are not visible but necessary for the figure to be "solid." You might build one of these figures from real cubes (sugar cubes will do) in class. One assumption in this problem is that there are no cubes "behind" each of the figures shown.

ANSWER: 16, 30, 14 (clockwise, starting at upper left)

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1124	This problem gives the student the chance to demonstrate that they know how "below zero" temperatures would be registered on a thermometer. In your small-group session, consider several similar problems. ANSWER: (-5°) 
2	1001 1019	Do a similar problem in class, using the same chart but different purchases and tax. ANSWER: $1.50
3	1111 1108	The purpose of this problem is to have students understand intuitively one of the traditional geometric construction problems--erecting a perpendicular to a line at a point on the line. This paper-folding method is easy for them, and produces about as good results for most students this age as using a compass and straight-edge. In your small-group session, have them do this with a line segment drawn on a sheet of scrap paper, and check on the "right angle" using the corner of another sheet of paper--if it's not right, they can try again. ANSWER: 
4,5	1047	These two problems are nothing more than computational exercises, but the size of the numbers make them challenging to most students. You might mention in class that they can't be done on a calculator, without being real clever, since the display won't hold that many digits. But a student who wants to try it on a calculator, certainly should be encouraged to do so. ANSWERS: (4) 65432109876543210 (Notice the pattern!) (5) 5046640550466405 (Pattern is 5046-6405)

6 1006
1007

Visual discrimination skill is combined with knowledge of geometric patterning in this problem. The major shapes--square, triangle, hexagon--"move" from right to left as you go from row to row, down the page. The "tails" move the opposite way, and the "eyes" remain stationary.

ANSWER:

7,8 1155
1156

The probability of an event, and the probability of the compliment of an event, are discussed in this exercise. Since there are 3 places "open" for the computer to make its mark, and 2 of them will give a win, the chances are 2/3 (read "two out of three," and not "two-thirds") that the computer will win on the next move. Similarly, there is one place where the computer might move and not win; the chances it will not win on the next move are 1/3. In your small-group session, go over a similar problem drawn on the board, being sure to interpret the probability statement in an intuitive manner to the children.

ANSWERS: (7) 2/3 (8) 1/3

9 1053

Students are exposed to doing multiplication problems mentally in this problem. Most people who practice mental arithmetic rapidly learn to do problems in a manner that is different from the normal algorithm, as in this case of working from "left-to-right." Go over several like this in your small-group session.

You might continue and extend this particular method of multiplication in your classroom, to a 2-digit times a 2-digit (as in 56x24). Some students--and teachers--become quite adept at this, and are truly flexing their "mental muscles."

ANSWER: To check the students for their stars, give them this problem taped to the table:

$$\begin{array}{r} 435 \\ \times\ 4 \\ \hline \end{array}$$

and have them do it completely in their heads. They should record on their paper, or whisper to you privately, "1740."

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1,2	1167 1005	These two problems combine several of the skills of excellence--mathematical flowcharts with a loop, and working backwards. In problem 1, Jason got "out of the loop" when his pencil was sharp enough the 3rd time he checked it. He had turned the handle 15 times, then. In problem 2, the student should think "in reverse" or "work backwards" mentally--if the handle was turned 45 times, then it must have been checked 9 times before Maria "got out of the loop." If students have a difficult time grasping the concept, have them actually go through the problem situation, using the class pencil sharpener. ANSWERS: 1. 15 2. 9
3	1050	The student should realize that the ten 1-digit numbers must include 0, and so the product of all of these numbers would be 0. In your small-group session, simply list the 10 digits to be multiplied, and many will notice the 0. ANSWER: 0
4	1005	Students have another chance to "work backwards" mentally in this problem situation. They know the final arrival time of the bus, and the time it took to get to each intermediate stop. Therefore they can continually "back up" the time, and eventually arrive at the times the bus arrives at each stop. Arriving at stop E won't be difficult--the normal subtraction algorithm "works" in this instance (8:30 - :14). But the time it gets to D will be somewhat harder, since the student must "borrow" with time in a different way than in the normal subtraction algorithm (8:16 - :22). In your small-group session, find the time the bus arrived at E as a group. Then the students are on their own. ANSWER: 7:20, 7:37, 7:45, 7:54, 8:16

5 1031
1035

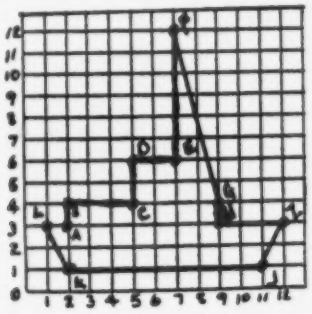
This problem involves several skills from the standards of excellence--estimating linear measurements and giving reasonable responses based on personal knowledge. The student should realize that an adult male would be about 2 meters high, just from visualizing what 2 metersticks would be, if put on top of each other.

ANSWER: 2 meters

6 1146

In your small-group session, be sure they can locate A, B, and then C.

ANSWER:



7 --

This non-mathematical problem has been included just as a point of interest for students. Most will realize that the jar itself would be dissolved by such a liquid.

ANSWER: The jar would dissolve.

8 1003

This problem will later be solved by multiplication of fractions--taking 1/3 of 1/2 cup means 1/3 times 1/2, which is 1/6. But at this point, 4th grade students have not been taught this; they can solve the problem if they draw a diagram, and reason logically. The diagram isn't necessary to get credit for the problem, but one like the one below is what would be called for. In your small-group session, help them draw the diagram, but don't help them find the final answer - leave that for their own ingenuity.

ANSWER: 1/6

9	1050 1005	This is a computational puzzle that requires some ingenuity. They might approach the boxes in a straightforward manner, asking such questions as "what can I subtract from 0 to get 1, etc.?" Or they might use "working backward," by asking "what number can I add to 1, to get 0?"

ANSWER:
$$\begin{array}{r} 5000 \\ -389 \\ \hline 4611 \end{array}$$

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1031 1145 1009	This problem involves estimating linear measurements, since the student will probably not know how to do a division problem with a 4-digit divisor. The students should approach the problem by thinking of 5,280 feet as about 5,000 feet, and the two heights as about 15,000 feet and about 29,000 feet. The first part of the problem is then easily seen to be "about 3 miles" - the second part is more difficult since you have to know that 29,000 is closer to 30,000 than to 25,000, forcing the answer to be closer to 6 miles than to 5 miles. Note that this problem also involves getting information from a chart or table, and solving a problem with extraneous information. In your small-group session, have the students find the approximate height of Mt. Kibo using the technique. ANSWERS: 3 miles, 6 miles
2	1009	In your small-group session, simply telling the students to be aware of unnecessary numbers should suffice as a hint. ANSWER: 26
3	1079 1004	Cover "prime vs. composite" numbers briefly for students, and have them label the numbers on the target as prime or composite. They can later use "guess-check-revise" to find where the arrows should go. ANSWER: The arrows can be either stuck in 19, 13, and 7 or in 13, 13 and 13.
4	1006 1123	This problem combines visual discrimination and the concept of elapsed time. The time shown on the watch is 4:15, so in 3 1/2 hours, it'll be 7:45. ANSWER: 7:45

5 -- This problem is not related directly to any of the skills of excellence, but it does reinforce to students that our method of "borrowing" does not hold with our English System of measurement. (The student should "borrow" an hour from "3 hours," and turn it into 60 minutes, giving a total of 79 minutes for the minuend.) Go over a similar problem in your small-group session.

ANSWER: 1 hour, 34 minutes

6 1001, 1020, 1023 This problem combines several skills from the standards of excellence into a multi-step word problem. It involves personal income and discount sales. Students will first calculate the total amount that Connie has ($9), and then either add the costs separately and take half of that, or take half of each item separately, and add those amounts. This total--$4.53--is then subtracted from $9, giving the answer. In your small-group session, go over the steps involved, without numbers.

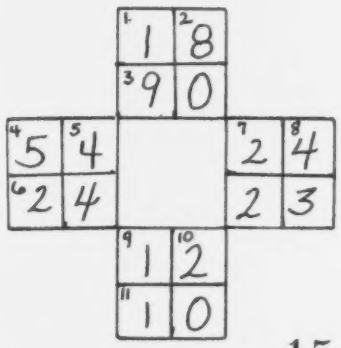
ANSWER: $4.47

7 1046 Briefly review the meaning of > and < with students.

ANSWER: (a) < (c) >
(b) > (d) =

8 1054 This problem is used to reinforce computation that involves the use of parentheses. Students should be taught to work from the "inside out" when dealing with parentheses. That is, "do what's in the parentheses first, and then move on to the rest of the problem."

ANSWER:



TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1006	Letters made from straight line segments go above the line, while those with a curve go below the line. Two reasons for including such problems in your regular classroom routine are: (a) They help break up the mind set established by an abundance of patterning problems (showing that in fact, there may not be a pattern to explain all logical arrangements of symbols). (b) A small percentage of students will see the solution to this problem immediately. These are students who perhaps have trouble with patterning problems, but can be rewarded for seeing something that most students have difficulty with. ANSWER: A EF HI KLMN T VWXYZ BCD G J OPQRS U
2	1050 1002	In your small-group session, take several similar problems for the group to solve. One way to organize the approach is to list the number pairs that add to the given sum, till you get a pair with the given product. Another way would be to reverse the process--list all pairs for the given product, till you find a pair with the indicated sum. ANSWER: 6,4 10,2 6,8 9,7 15,3 Note: Either number in the pair can be listed first.
3	1126	Take a similar problem in your small-group session. Show the students how to count half-squares. ANSWER: 5 1/2, 10 1/2

4 1006
1007

The shapes move from the inside out, as you move from left-to-right with this geometric pattern. In your small group session, ask people to share what they noticed about the pictures as they go from the left picture toward the right.

ANSWER:

5 1002

In your small-group session, help your students begin a chart or list of the days each person eats at the restaurant, as in the one below:

Days from today	People eating			
	S	M	R	F
1	✓			
2	✓	✓		
3	✓		✓	
4	✓	✓		✓
5	✓			
6	✓	✓	✓	

etc.

ANSWER: 12

6 1170

In your small-group session, pick a birthday (to use as an example) from a student not in the group. Go through the steps, showing how to get the final display.

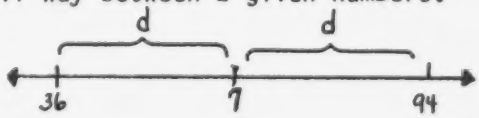
ANSWER: The first 4 digits tell the year the student was born--the last two tell his or her age.

7 1004
1003

Consider a similar problem in your small-group session, and show several ways to find the answer:

Guess-check-revise: Guess a number, and check the arithmetic. Revise the guess either up or down.

Find the average of the two numbers: This is the number that's half way between 2 given numbers.

Draw a sketch: 

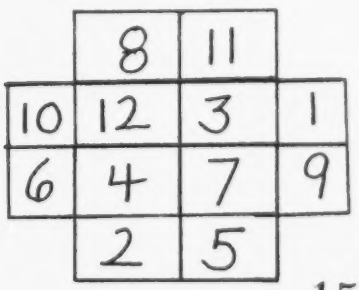
You might use: What number is as much greater than 2 as it is less than 9 (answer is: 5).

ANSWER: 65

8	1036	Help students draw-in the horizontal and vertical lines on the 3 drawings. Then find the first answer together. They do the other two themselves. (Note: They should first count whole units, and then "piece together" other parts to make whole units; this way they'll count only whole units, and possibly put together a few easy fractional parts like halves.) ANSWERS: 11 cm^2, 16 cm^2, 9 cm^2

TEACHER COMMENTARY

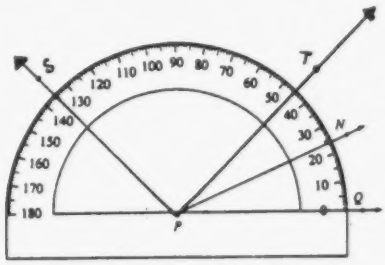
Problem	Skill of Excellence	Comment
1	1001	Draw a circle graph on the board, dividing it into 25%, 15%, and 10% regions. The question for the students to answer, then, is what percent is the rest of the circle graph? ANSWER: 50%
2	1003	In your small-group session, have students draw in all the lines from Sam to another student, and then all from Art to someone else (do not redraw the one to Sam). Be sure they all realize they have 9 games represented at this point. ANSWER: 15
3	1022 1123	Have students compute the elapsed time from Jacksonville to Ft. Lauderdale (6 1/2 hours) to be sure they understand how to read the table. ANSWER: 11 1/2 hours
4	1032 1001 1122	In your student session, go through the same problem, but with different numbers than those given. To get the second part of the problem, they'll have to change around 200 seconds into minutes. Have them do this by subtracting 60 from 200 as many times as possible ("pulling out" 1-minute intervals repeatedly) rather than by dividing. ANSWERS: 3rd man 3 minutes and 13.96 seconds 3 minutes and 14 seconds
5	1050 1004	Encourage students to use "guess-check-revise" for this problem. ANSWER:



6 1131

Give students a protractor, and have them measure several angles. Be sure they understand that one of the angle's rays must go along the base line of the protractor, the vertex must be at the center of the base of the protractor, and the size is measured by where the other ray (extended, if necessary) crosses the scale. They will enjoy this, and need additional practice to become proficient at it.

ANSWER:



7 1127

In your session, make such a box out of sugar cubes. Tell the students they can imagine such a figure , make one, or compute the answer by multiplying when they attempt the problem on their own.

ANSWER: 128

8 1001
1009

A student will either read carefully and find the answer in the problem itself, or compute $(8 \times 50) + (1\ 1/4 \times 40) = 400 + 50 = 450$.

ANSWER: 450

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1036	In class, take a similar problem and have students solve it by counting all the whole units, and then visually put together partial units to make other whole units. (Do not attempt to have them add fractional pieces via arithmetic.) Be sure they understand the symbolism for "square kilometer" is km^2. ANSWER: C
2	1006 1128	To be successful on this problem, students will need to look at the three pictures in an unusual order--upper right, then upper left, then lower picture. ANSWER: 24 grams
3	1021 1002	Suggest that students who don't know how to begin this problem make a chart like the one started below. ANSWER: B
4	1108	Review briefly for your students, using cardboard cut-out shapes, the basics of slides, flips, and turns. ANSWER: The last figure

	Mon	Tues	Wed	Thurs	Fri
3:00					
3:30	Dance			Dance	
4:00					
4:30					
5:00					
5:30					
6:00					
6:30					
7:00					
7:30					

5 1006

Encourage students to share how they solved this problem. Most will do so by trying to visualize the cube in its various positions. A few will take a kleenex box or something, and make the faces as shown. Some will solve it by process of elimination (• can't be opposite the ones you can see when it's visible, so ...).

ANSWER:

6 1170

This activity can be a good introduction to the Logo computer language. The students will need to know that a left or right turn of 90° is needed for the square corner. The student can follow the directions with his body, or direct another student to move forward 20 steps, turn right 90° to discover what actually happens with the turtle on the screen. Note: The degree measure of an angle was introduced in Worksheet X, but most 4th graders will know intuitively what a 90° angle looks like anyway.

ANSWER:

7 1050
1005
1004

Consider a similar problem in your small-group session. Some will solve it by working backwards - reversing each step from the end result, to get the tarting number. Some will use a (modified) guess-check-revise, by simply making an educated guess at the first number, and revising it till they find the right starting number.

ANSWER: 20

8 1002
1003

In your session, ask students if they've seen a problem like this before. (It's quite similar to #2 on Worksheet IX.) So they can draw a diagram to solve it, or perhaps make a "paired list" solution, e.g.,

(Betty, William)
(Betty, Marcus)
etc.

ANSWER: 10

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1009	Mention to the students that there's a number visible in the problem, that has nothing to do with the answer. ANSWER: 3/4
2	1018 1005 1004 1001	Most students will figure that the two items together must cost \$1.00 minus 20¢ minus 5¢ or 75¢. Then they'll look for two items that total 75¢. You might mention in class that they are mentally "working backwards" when they do this--they know the end result of their purchases, and are asked to find the actual items bought. ANSWER: Grilled cheese and milk
3	1035	In your small-group session, have the children think of some "benchmark" temperatures, and relate them to this problem. They could also watch the evening weather report to get an outside temperature reading, and get a feel for the given choices from that. ANSWER: 25°C
4	1050 1005 1004	In your small-group session, mention 2 basic ways of finding the divisor for this problem. The simplest (but an inefficient one perhaps here) is to simply "guess-check-revise" single digits; if so, you'll finally get one that works. The other way is to work backwards--look for multiplication-type clues. (The divisor times the last digit in the answer must be 56.) ANSWER:

```
      5 3 8
   ---------
7 ) 3 7 6 6
    3 5
    -----
      2 6
      2 1
      -----
        5 6
        5 6
```

5 1078

You will need to go over a similar problem with your students, covering what the symbol $\leq$ means.

ANSWER: 0, 1, 2, and 3 ("0" is optional)

6 1123

Students will not need help on this problem--it's a simple "elapsed time" situation, with no unusual computational steps.

ANSWER: C 8:11
D 8:14
School 8:27

7 1145
1123

This problem again involves elapsed time, but the students must also read and correctly interpret the chart to get the correct answer. Use the chart in your small-group session, but ask similar questions.

ANSWER: (a) 8:45 (b) June

8 1168

Have students solve the similar problem in class:

> If you start adding the whole numbers in order, what number do you add to get the sum above 100? (14 is the answer.)

ANSWER: 45

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1002	This problem gives the student an opportunity to use a list as an organizer to solve a non-routine problem. The two types of charts or lists that students will likely use are shown below:

Quarter	dime	nickel	penny	penny		
x	x	x	x	1	1¢	✓
x	x	x	1	1	2¢	✓
x	x	1	x	1	3¢	x
x	x	1	1	1	4¢	x
.	.	.	.	.	.	
.	.	.	.	.	.	
.	.	.	.	.	41	✓
.	.	.	.	.	42	✓

The second type above, where they list all the possible numbers from 1¢ to 42¢, and then see if they can make that amount using their coins, is perhaps the easiest to use, in this case.

In your small-group session, start off the two lists above for the students--they can re-do the lists at home.

ANSWER: 23

2	1001 1018 1020	Some students will be able to do this problem mentally, if they round $9.99 off to $10. ANSWER: 8 1/2 or 9 hours
3	1031	Since the exact starting and ending points for these measurements are somewhat unclear (do you measure from dot-to-dot, or from the "near side" of the planet to the "near side," or what?), the answers given force the student into estimating a reasonable answer, and eliminating those that are not reasonable. The shortest possible length (near-side to near-side) would give 600 garkons--the longest possible (far-side to far-side) is 800. This leaves 700 as the only choice available that's within the ball park. ANSWER: B

4 1075

Naming base-ten numbers as base-two numbers is the problem for this exercise. If only a few students got this problem correct, you'll want to spend some time developing the concept using very concrete objects. You can bundle sticks, etc., in groups of 2's, using a chart like:

...	Bibitwos	Bitwos	Twos	Units

etc. (Students can make up their own word-naming system for these numerals, also--there's nothing sacred about "Twos," "Bitwos," etc.)

ANSWER:

1001	9	1101	13
1010	10	1110	14
1011	11	1111	15
1100	12	10000	16

5 1109
1006
1002

Students have a chance to demonstrate their knowledge about classifying triangles in this problem. They also must use some visual discrimination, since all of the right triangles are not obvious.

If they have trouble keeping up with all of the right triangles, this would be a good place to reinforce "making a list." They could label all the vertices, and write down those that are right triangles, as they go. There are 8 in the first figure, 0 on the 2nd, 2 in the 3rd, and 3 in the 4th.

ANSWER: 13

6 1125

Students must be able to compare the lengths of several objects to solve this problem.

ANSWER: 3

7 1050 In your small-group session, write

$$1 \times 2 \times 3 \times 4 \times 5 \times 6 \times 7 \times 8 \times 9 \times 10 = 3628800$$

on the board. Then show that there are two tens being used as factors on the left, (after putting the single digits 2 and 5 together as 10). That's where the two zeros at the end of 3628800 come from.

Then put this on the board:

$$3628800 \times 11 \times 12 \times 13 \times 14 \times 15 \times 16 \times 17 \times 18 \times 19 \times 20$$

or

$$3628800 \times 11 \times (2 \times 3 \times 2) \times 13 \times (2 \times 7) \times (3 \times 5) \times (2 \times 2 \times 2 \times 2) \times 17 \times (2 \times 3 \times 3) \times 19 \times (2 \times 2 \times 5)$$

and ask how many tens they can find that would add zeros to 3628800. There are 2. So the product up to 20 would have 4 zeros on the end.

ANSWERS: 4, 7

8 1153 1155 1157 In class, toss the pair of dice 10 times and record the sum on the board in this chart form. Go through each of the three parts, using this small amount of data. (Doing so will also point out the need for large sample sizes, since some sums probably won't come up at all in only 10 tries.) They then re-do the experiment at home.

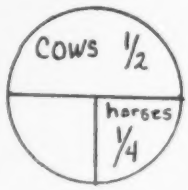
ANSWER: To judge their answer, first count quickly to be sure they have 50 tally marks (hopefully they've grouped them (𝍸)) for you. Then check only one or two of the entries, to be sure that they recorded the probability as a fraction, with that number of tally marks over 50. (Assume that if they did this for one or two correctly, they did it for all of them in the same fashion.) Then check parts A and B ("most often" and "least often") against the tally marks they recorded.

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1126	In finding the areas of these figures, students will probably count whole squares and half-squares. They might find the area of the larger figure first, as if it were solid, and then find the area of the "hole," and subtract. Or they might just count the darkened-in squares and half-squares directly. In your session, do only the first picture together. ANSWERS: 22, 8, 50
2	1006	This problem requires some visual discrimination. Suggest that students who are having trouble "seeing" it, can take out tinker toys or coins, and arrange them so they'll turn each other. Perhaps this will help them visualize the motion involved. ANSWER: Counterclockwise
3	1010	The intent of this problem is to focus on students making conjectures that are plausible, but which can't really be checked out. Therefore, this should enhance their "risk-taking" skills, helping them make tentative hypotheses in problem-solving situations. (Hopefully the student will notice that the <u>even</u> gears move counterclockwise, etc.) ANSWERS: clockwise, counterclockwise, counterclockwise, counterclockwise

4 1003

To solve this problem, students need to realize that "the rest were pigs" means "1/4 were pigs." They might have known this from the fact that, as a fraction, all the animals must add up to 1, and since horses are 1/4 and cows 1/2, that leaves 1/4 for the pigs. Or they might see this better if they drew a circle diagram, as shown to the right, to see that 1/4 of the circle would be left for the pigs. If the student draws such a sketch, they're using skill 1003--drawing a diagram to resolve a problem situation.



ANSWERS: 8, 16

5 1032
1004

Students can approach this by division ($1.25 ÷ 6) and rounding the answer to the nearest cent, or through "guess-check-revise" by taking the four choices, multiplying each by 6, and seeing which is closest to $1.25.

ANSWER: $0.21

6 1005
1055

This is a computational puzzle that requires some ingenuity, and knowledge of both fractions and mixed numbers. The student has to know how to change whole and mixed numbers into fractions with denominators of 8, and then the fraction that must be added to 5/8 to get this number. In your small-group session, show students how to find only one of the answers.

ANSWERS: Starting at upper right and moving clockwise:
1/8, 5/8, 11/8 or 1 3/8, 7/8, 2/8 or 1/4, and 3/8

7 1167

In your session, take a couple of familiar temperatures (in both Fahrenheit and Celsius) and go through the flowchart. For example, 212°F should give 100°C, and 32°F should give 0°C.

ANSWERS: 15, 30, 50

8 1005 1004

Mentally "working backward" is probably the way most students will solve this problem. They would do so by asking themselves:

> To get an answer of 60, after multiplying by 5, what number did I have the step before? It must be 12. So if I have 12 after dividing some number by 9, what number did I have the step before--aha, must have been 9x12 or 108. So if I had 108, what number did I start with so that, after subtracting 32, I had 108? Aha, it was 140.

Some other students might solve the problem by "guess-check-revise." They might get a start on a good guess by noticing that, to produce 60 as an answer, their input would have to be greater than 122 (from the problem above). So they'd start guessing input numbers, till they narrowed down their guesses. Go over these processes, but for a Celsius temperature of 95°C.

ANSWER: 140

9 1003

Students who get the correct answer will have to organize some method of knowing which dots they count as they go--some students will cross them out, while others will draw small circles around the dots, and count those in the circles and add all of them together. Some who are really conscious of organizing their work--although it's probably not an advantage in this type of problem--will draw their groups of dots so each will have 10 in it, to make the overall counting easier.

The answer of 149 was chosen purposely--some who get this answer will think they must have counted wrong, since they're only 1 away from 150. They won't trust their own ability.

ANSWER: 149 (Count the dots yourself on one of the student worksheets, to be sure that extra dots weren't added by the copying machine.)

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1007 1010	Have students use a calculator to solve (1234x9)+5=?, and then make sure they understand that their first answer is really only a conjecture. There's no way to really know if such a pattern continues or not, without proving it. ANSWER: Yes or no 111, 111, 111
2	1029	The question to be asked of students is "how could you decide between 12,000 and 13,000 as the answer?" (A clue is that, under the 3, the digit must be either 0 or 1, to get a 4 below it. So there's nothing "carried" to the next column. So a computed answer would be 12,4 ? 9 which is closer to 12,000 than 13,000.) ANSWER: a. 12,000
3	1079	Review briefly what prime and composite numbers are, and then label several similar numbers to those given in the problem. ANSWER: (a) C (b) P (c) C (d) P
4	1124	Point out to students that both Celsius and Fahrenheit readings are given, but a Fahrenheit answer is called for. So the student will have to convert 0°C to its Fahrenheit equivalent. Fortunately, this is easy since 0°C is familiar as the freezing point of water, which is 32°Fahrenheit. ANSWER: 63°F
5	1007	Encourage students having trouble with this pattern to look from right-to-left, as well as left-to-right. ANSWER: 69, 45, 33

6 1007

Again, students having trouble should look at this puzzle in a manner other than left-to-right, top-to-bottom.

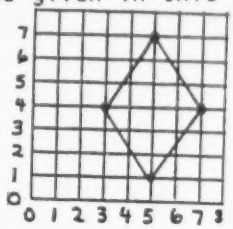
ANSWER:

4	$1\frac{1}{3}$ or $\frac{4}{3}$	$\frac{4}{9}$	$\frac{4}{27}$
2	$\frac{2}{3}$	$\frac{2}{9}$	$\frac{2}{27}$
1	$\frac{1}{3}$	$\frac{1}{9}$	$\frac{1}{27}$
$\frac{1}{2}$	$\frac{1}{6}$	$\frac{1}{18}$	$\frac{1}{54}$

7 1146

Remind students of how to graph points on a Cartesian Coordinate system, using several examples other than the points given in this problem.

ANSWER:



Connect:

(5,7) to (7,4) to (5,1) to (3,4)

Then connect (3,4) to (5,7).

8 1155
1156

Go over a similar problem in class, but using a calendar for the month you're presently in. Ask "What are the chances you'd pick a Sunday?" and "What are the chances you would not pick a Sunday?" [The denominator would be the total days in the month; the two numerators would be determined by counting Sundays, and then counting non-Sundays in the month.] DO NOT stress reducing a fraction to lowest terms, or finding the complementary probability by "subtracting from 1."

ANSWER: (a) 11/12 (b) 9/12 or 3/4

9 1006
1007

Ask the students to name the attributes that make zorkies different (numbers of eyes, arms, and legs). Then have them tell what they notice about these attributes, as they look across a row, or down a column.

ANSWER: The zorkie should have 1 eye, 4 arms, and 3 legs, and be cute!

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1004	This is a word problem which can be solved by guess-check-revise, since the students don't yet have algebra skills. To do so, they would guess consecutive pages--10 and 11, for example--and check to see if the product is 240. Since it's not, they would use the information to revise their guess, in this case upward, to increase the product. They might try 12 and 13, etc. Finally, they'll get the correct answer. ANSWER: 15 and 16
2	1034	In your small-group session, consider a similar problem. The fractions should have large enough denominators to discourage computation, but be fractions that are either close to zero or one in value. This forces students to develop a "feel for numbers" to get the correct answer--they'll have to realize intuitively that two of the fractions are numbers close to 0, and two of them are close to 1. So the sum of all the mixed numbers would be close to 1 + 4 + 5 + 8. ANSWER: 18
3,4	1053	The purpose of these problems is to introduce an alternative way for a student to do a multiplication problem. Certainly no student would choose this as the primary way to multiply whole numbers, but they do need to realize that the algorithm we use is just one of many that have been learned down through the ages. This one is not that inefficient either, once they practice it enough. Go over the 37 x 41 example in class, starting from scratch. ANSWERS: 3. To get credit for the problem, the student should have 24, 96, and 768 in the blanks, and 888 as the sum. 4. Their work should look like:

Half	Double
~~36~~	~~41~~
~~18~~	~~82~~
9	164
~~4 r1~~	~~328~~
~~2~~	~~656~~
1	+1312
	1476

or

Half	Double
41	36
~~20 r1~~	~~72~~
~~10~~	~~144~~
5	288
~~2 r1~~	~~576~~
1	+1152
	1476

5 1006

Suggest that students having trouble with this "act it out" at home, by using a flashlight in a dark room, with a picture on their wall. Tell them to look for shadows.

ANSWER: Upper left

6 1154

Remind students of how to find an average, and tell them where to look in their books if they forget.

ANSWER: B

7 1110

The concept of "simple closed curves" is from the area of topology. Most students will find the answer by shading in the inside, or by drawing a path with their pencil. You might allow them to casually observe you doing it an easy way, on a similar problem drawn on the board.

> Draw any line from the outside of the figure to the point. As you start moving in along the line, say "outside, inside, outside, inside, etc." each time you cross the line. You'll wind up saying "outside" when you're at point X.

ANSWER: outside

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1001	Have students find the number of legs on 5 pigs and 10 chickens, in your small-group session. ANSWER: 106
2	1050 1004	Have students do a similar problem in their small-group session. Be sure the example involves "borrowing." ANSWER: 50682 -43896 6786
3	1023	Ask students how they find "1/2 off the regular price." The problem doesn't mention tax on the purchase, but some may have added it anyway. ANSWER: $1.75 (or $1.84, with 5% tax)
4	1051	Ask students to compare several pairs of fractions with the same denominators (like 3/5 and 4/5, or 5/7 and 2/7). Be sure they understand that, if the denominators are the same, the fraction with the larger numerator is the largest fraction. ANSWER: <
5	1076 1010	In your small-group session, give each child a calculator and have them go through each of the six problem types together. They'll all use different even and odd numbers, but should get the same type answer for each problem type. Be sure they understand that they haven't <u>proved</u> anything by the experiment, but they have enough evidence to make an educated guess for each problem type. ANSWER: A. even D. even B. even E. even C. even F. odd

6	1144	Ask a similar question to that of the given problem to be sure students are correctly interpreting the symbols and partial symbols. ANSWER: A. 25 B. 75
7	1122	Give students the hint that they have to subtract 113 years, 214 days from 114 years. The question is how can they compute a problem like: 114 years - 113 years, 214 days (It helps to line up the place values, and "borrow" creatively, as in 114 years = 113 years, 365 days.) ANSWER: 151 days
8	1128	Ask students to tell you some things they know are measured in Celsius, meters, liters, and grams. Then which one of those categories sounds more likely to be attached to the mass of a banana? ANSWER: grams

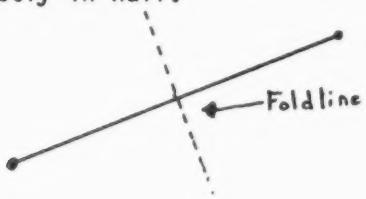
TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1006	Suggest that students organize their search by going from smallest to largest, in their search for squares. ANSWER: 13 (6 small squares, 5 medium squares 2 large squares)
2	1001 1018 1009	Have a student describe what he or she did to solve this problem. Mention that 5% is a number that appears in the problem, but which isn't used in the arithmetic at all. ANSWER: $4.37
3	1032	This problem is used to give the teacher a chance to concretely show students how to round off a decimal to the tenths place. The decimal point is necessary (because $ is used), but students will know intuitively whether a given amount like 36¢ is closer to 3 dimes or 4 dimes. Extend this example into the regular class setting, gradually weaning the students from thinking just of money, to thinking of decimals in general. ANSWERS: 4 dimes or 40¢, 2 dimes or 20¢, 4 dimes or 40¢, 6 dimes or 60¢, 2 dimes or 20¢, 8 dimes or 80¢
4	1051	In your small-group session, show students how to shade in one of the four fractions. Suggest that they make a similar drawing at home, since there's not enough room on the one given to represent all 4 fractions. ANSWER: 1/4, 1/3, 1/2, 2/3
5	1078	Take a pair of similar statements in your small-group session, and solve them together. Stress that symbols like >, <, =, ≥, and ≤ separate a sentence into two parts; <u>everything</u> on the left side is being evaluated and compared to <u>everything</u> on the right. ANSWER: 2, 3

6 1111

Go over this method of bisecting a line segment in class. Mention that the "fold line" is actually a "perpendicular bisector." [Note: The reason for this paper-folding construction method, prior to straight-edge-and-compass, is to get across the meaning of "bisector" at an intuitive level.]

ANSWER: Check to be sure the line segment is cut exactly in half.



7 1123
1122

The only difficult part of this problem, which you might want to cover in class, is converting a time like 7:65 PM to 8:05 PM.

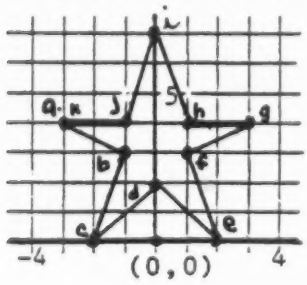
ANSWER: 8:05 P.M.

8,9 1155
1156

Take a similar spinner, but one divided into 4 or 5 regions instead of 3, and ask 2 similar questions. Interpret a probability like 1/4 as "one out of four," rather than "one fourth." Find the complementary probability by counting regions also, rather than by "subtracting from one."

ANSWERS: 8. 1/3 or 1:3
9. 2/3 or 2:3

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1050	Suggest that students who have trouble look at the multiples of 12 that are greater than 100, and find the subgroup that's a multiple of 9. They can use a calculator. ANSWER: 180
2	1127	Many students may compute the amount of dirt that was in the hole. However, the answer is that there is no dirt in a hole. ANSWER: None
3	1001	Have a student who solved this problem explain what he or she did computationally, without giving the actual answer. ANSWER: $49.30
4	1146	Students will have plotted ordered pairs of points several times prior to this, but this is the first time negative numbers have been used. Show them how to find and connect the first few points. ANSWER:  Points students should mark. a. (-3,4) b. (-1,3) c. (-2,0) d. (0, 2) e. (2, 0) f. (1, 3) g. (3, 4) h. (1, 4) i. (0, 7) j. (-1,4) k. (-3,4)
5	1156	Have seven cards similar to those shown (playing cards from a deck will do), and go through the problem. Be sure students know the difference in odd and even numbers. ANSWER: 3 out of 5 (or 3/5)

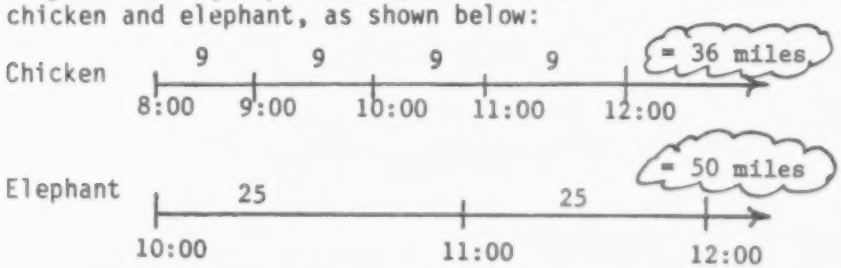
6 1050
1004

Students will probably use a "guess-check-revise" technique to solve this puzzle. In your small-group session, give those who haven't yet solved it three of the "corner points" below, and they can manipulate the other 7 digits to finish the puzzle.

ANSWER: The answers will vary.

7 1022
1003

In your small-group session, draw a sketch for the chicken and elephant, as shown below:



Suggest that the students draw similar lines for the lion and cow at home, to help them visualize how far away each animal would be at 12 o'clock.

ANSWER:

ANIMAL	SPEED (MPH)	DEPARTURE	PLACE AT NOON	
CHICKEN	9 MPH	8:00 am	36 miles	3rd
ELEPHANT	25 MPH	10:00 am	50 miles	2nd
LION	50 MPH	10:30 am	75 miles	1st
COW	11 MPH	9:00 am	33 miles	4th

8 1035

To do this problem, the student must understand temperatures in Celsius and Fahrenheit. When working with this skill the students may need to be given points of reference such as:

0°C/32°F water freezes
38°C/98.6°F normal body temperature
100°C/212°F water boils

ANSWER: 36°C

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1050 1002 1004	Solve one or two similar problems in your small-group session. For each one, students can think either of number pairs with the indicated sum, till they find the pair with the correct product; or they can reverse it, looking at pairs for the given product, checking each out till they find the correct sum. (If they have trouble, they can make a list of such number using a modified "guess-check-revise" scheme. ANSWER: These pairs should appear, with either number coming first in the pair. 7,2 3,6 3,9 2,8 7,1
2,3	1148 1001	Give students the hint that the "food" section of the graph is the same size as another section. Once they know this, they can find the remaining amount for entertainment since they know that the total graph must add up to $1.00. ANSWERS: 2. 25¢ 3. 40¢
4	1168	This problem involves the use of a calculator. Certain digital numbers resemble letters if turned upside down. By performing these operations the student will find a word displayed in the display window. ANSWER: 7105 or SOIL
5	1050 1004	Give students a hint that they can use "guess-check-revise" to find each digit of the multiplier. If they are clever, they can get hints as to which digits might work and which ones won't, by looking at the digits that <u>are</u> shown. ANSWER: 435 × 21 = 9135

6 1036 The student has been given a two dimensional sketch, overlaid on a centimeter grid, and has been asked to determine the approximate area of the figure. The irregular figure does not exactly "line up" with the grid, therefore the student has been given a multiple choice format. Ask students how they estimated the area, and look for such different ways as:

> I counted all the whole squares, and the fractional parts as best I could, and added them together.
>
> or
>
> I took pieces of the turtle that seemed to "go over" the line somewhat, and put them in squares that didn't quite have enough to make a whole square. So I made all the whole squares I could, from the pieces.

You might also mention another way, such as:

> Count the whole squares, and just every other partial square (hoping the partial squares you count sort of "equal out" on the average).

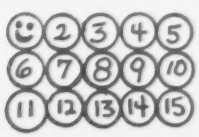
ANSWER: about 16 cm^2

7 1131 Have several angles for the students to measure in your small-group session. (See the teacher's commentary for Worksheet IX, problem 6.)

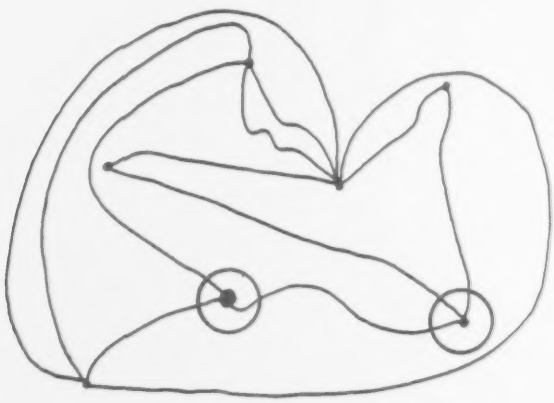
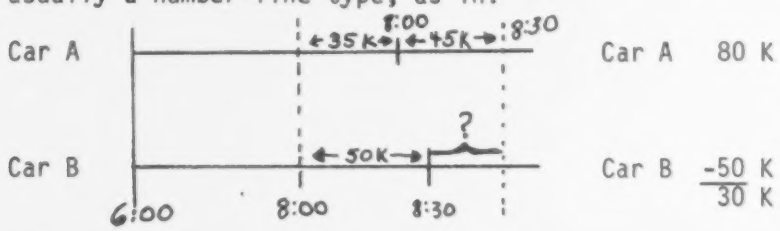
ANSWER: 25 degrees

8 1079 This problem gives the student another way to distinguish prime and composite numbers. In your small-group session, take two numbers of unit squares (made from cardboard or some other durable material) like 23 and 24. Have the students make all the different types of rectangles--4 such--for 24 squares, and then all those for 23. This should clarify the definition of prime or composite for them, on a concrete level.

ANSWER:



TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1110	Encourage students to look at each vertex of the network. If the vertex has an odd number of paths going into or coming out of it, you'll have to start there, or finish there, to trace the network. (Note: The only networks that can be traced have either 0 or 2 odd vertices. If the network has 0 odd vertices (all vertices have an even number of paths), you can start anywhere and trace it, and you'll end where you started. If it has 2 odd vertices, you start at either and you'll end at the other. Any more than 2 odd vertices, and it's impossible to trace.) ANSWER: 
2	1126	In your small-group session, remind students of how to count whole squares and half squares. ANSWER: 19 1/2
3	1003 1001	Encourage students to draw a diagram. The best diagram for a problem that involves length or time is usually a number-line type, as in:  ANSWER: 30 Kilometers

4 -- Suggest in your small-group session that students check their answer by actually looking in a magazine. They might be surprised.

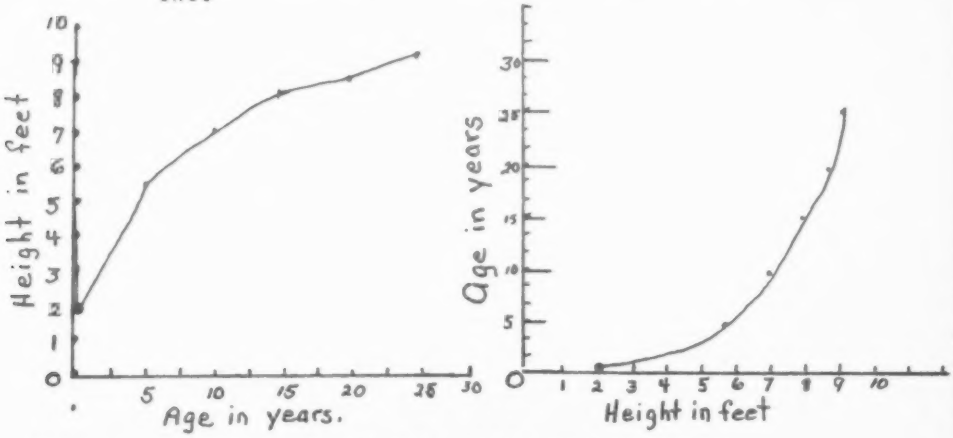
ANSWER: 4

5 1168
1001 Students can use their calculators to solve this problem.

ANSWER: C

6 1147 In your session, you might help the students who have not made the graph by giving them the axes to start, and then plot the first two points and connect them.

ANSWER: Their graph should look like one of these two.



7 1153
1157 Show the students how to make tally marks in the graph, by doing the thumbtack toss yourself, but only 10 times. Fill in the graph and answer the question, based on this small amount of data. They can re-do the experiment at home.

ANSWER: Conditions to check for are these:

1. Total of all tallies must be 25.
2. The sum of the two fractions must equal 1.
3. Conclusion should reflect data collected.

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1010	In your small-group session, ask students for examples they found in which reversing the 3-digits, subtracting, reversing that answer and adding, produces 1089. Hopefully students will conjecture to themselves that this will work with any such 3-digit number (if the hundreds digit is larger than the tens digit). ANSWER: Any 3-digit number if hundreds digit is larger than tens digit.
2	1023 1001	Ask students how they find 1/3 and 1/4 of a money amount. This should give them enough assistance in solving this problem. ANSWER: $52.22
3	1035	Go over a similar problem in class. The fractions were purposely made computationally unmanageable, forcing the student to estimate by rounding 45/50 to 1 and 1/49 to 0. ANSWER: b. 30
4	1046 1051	Mention to your small group that they need to evaluate both sides of the expression independently, before deciding on >, <, or =. Do example (a) in class. ANSWER: a. > c. < b. = d. <
5	1074	Remind the students that they have solved problems like these before, but usually they've had $\square$'s instead of X's and Y's. But in preparing for algebra, they need to get used to letting a letter of the alphabet stand for a number that you don't know. Go over example (a) in class. ANSWER: (a) 9 (c) 10 (b) 26 (d) 11

6	1006 1108	Briefly review the geometric concepts of slides, flips and turns. Encourage students to check their answer by tracing the figure in the thought cloud, and then seeing which of the given figures it will match through one of these 3 "rigid motions." ANSWER: The second from the left.
7	1129	The essence of this problem is to subtract in a situation that requires "borrowing" in a non-base ten system. 197 pounds must be renamed as 196 pounds 16 ounces. Consequently the student has to convert 1 of the 197 pounds into 16 ounces. In your small-group session, do a similar problem with different numbers. ANSWER: 180 pounds, 5 ounces
8	1168 1054	Take a similar problem in class, with students using calculators. Have them first do the problem in the order presented, and then dealing with the parentheses. Different answers should indicate to them that something is amiss. Show them how to do a problem by working within the parentheses first (storing the result in memory, if you can, till it's needed later). ANSWER: 5058
9	1035	Many students will miss this problem because they divide 10 by 2, not realizing that cutting a log into two pieces only requires 1 cut. Give them the hint to go back over their thought process, and actually "act it out" if necessary. ANSWER: 20 minutes
10	1002	Suggest that someone having trouble with this problem might list the days of the week first, and locate the answer by counting back 6 days from Friday. ANSWER: Saturday

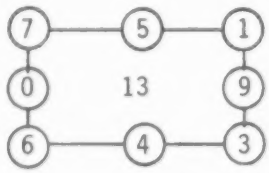
TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1001 1003	Suggest that students having trouble draw a sketch of a carton of eggs, and use it to find the answer. ANSWER: 2 eggs left
2	1002	This is the first "logic problem" that appears in SUPERSTARS II--students will need to be shown how to use a chart to solve such problem. The general procedure is for the chart to list all possibilities in matrix form, and for the solver to go through the clues over-and-over, marking out things that can't be true (X). By process of elimination, eventually you will mark (√) a true possibility; this allows you to mark out even more untrue possibilities (X). Usually you have to go through the clues over-and-over again, to solve the problem. In the given problem, the chart should look like these after the first two clues: After 1st clue: 1st 2nd 3rd 4th Red White Yellow Blue X After 2nd clue: 1st 2nd 3rd 4th Red White X Yellow Blue X In your session, carry the chart through at least the first 2 clues, and a situation in which you can conclude a positive fact from the process of elimination. ANSWER: Yellow White Red Blue
3	1021 1002	Encourage students to use a calendar, or list the dates in March (13-31), if they don't know how to begin. ANSWER: March 27th, April 1st

4 1050
1004

For students having trouble, you might give them two of the corner points below, and let them finish it at home.

ANSWER:



(Example is shown. Answers may vary.)

5 1075

This problem asks students to rename a base-two numeral into a base-ten numeral. In base-two the place values are ones, twos, fours, eights, sixteens, etc. The only symbols allowed are 0 and 1 because you regroup when you get two of anything. You might provide some bundled sticks and a chart like the one below so that students can work these problems (and others you may give them for practice) in a learning center.

eights	fours	twos	units
	1	0	1

ANSWER:
101 = 5
11 = 3
1001 = 9
1101 = 13

6 1001
1145

Students will need little help on this problem, beyond an overview of what the chart means. You might have a student who has already done the problem simply describe the steps, as in "find out how many each team has collected, add those 4 numbers, and subtract the total from 1000."

ANSWER: 250

7 1166

Bring an apple to class, and have a child go through 3 bites, using the steps of the flowchart. Point out the looping involved, how to get out of the loop, and ask them where they think a counter would go when inserted (anywhere inside the loop, before the decision step).

ANSWER: The numerical answer will vary. The child's flowchart should have the additional step "Mark 1 More" inside the loop, before the decision.

8	1001 1030	Review in class how to estimate the solution mentally (4x20¢=80¢; 2x60¢=$1.20; 80¢+$1.20=$2.00, so "no"). Then give them a practice sheet with 5 or 6 similar problems, and answers, so they can practice at home. ANSWER: Have this problem taped to the table where students hand in their worksheet. After reading problem, they mark their answer ("yes" or "no") in box on their worksheet.

Allan has an allowance of $3.00. He has already spent $1.40 on a model airplane kit. He needs to buy glue for 28¢ and paint for 99¢. Will he have enough money?

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1002	Suggest that students start by listing the multiples of 7 with 2 digits, till they get one that satisfies the other criteria. ANSWER: 70
2	1076	This problem is designed to reinforce classifying sums, differences, products, and quotients as odd or even numbers. That the answer is 0 makes it interesting because some children have difficulty with zeros. ANSWER: Even
3	1001 1018 1019	Have a child who has done this problem describe the type of computation they did to get an answer. ANSWER: $4.71
4	1020 1030	In your small-group session, compute the cost of a), and show the students that they'll have to compute b), c) and d), and <u>then</u> find the one closest to $5. ANSWER: b
5	1124	In your small-group session, ask students how they can determine what the temperature is, since it's not at one of the numbers or even at an unnumbered mark. Summarize with "First determine what numbers would be at each mark, if they had room to put them in. You can do this by skip counting. Then figure out the readings between the marks." ANSWER: -6° (or, 6° below zero)

6 1154 1001

Calculate Sue's average in your small-group session, and briefly mention how to complete the problem.

ANSWER: 2

7 1004

Suggest that students solve this by working backwards. I.e., ask themselves "what was the number before it became 152? What was it the step before that? Etc. (Do not teach them a simple rule like "reverse all the signs and work backwards." Let them find such a rule themselves.)

ANSWER: 83

8 1050

Suggest that students use a modified "guess-check-revise" approach to solving this puzzle. They can guess at "T," and check the digit till they get one which yields an 8 in the ones place when used 3 times as an addend. They can continue along this approach.

ANSWER:

```
  8376
  8376
+18376
 35128
```

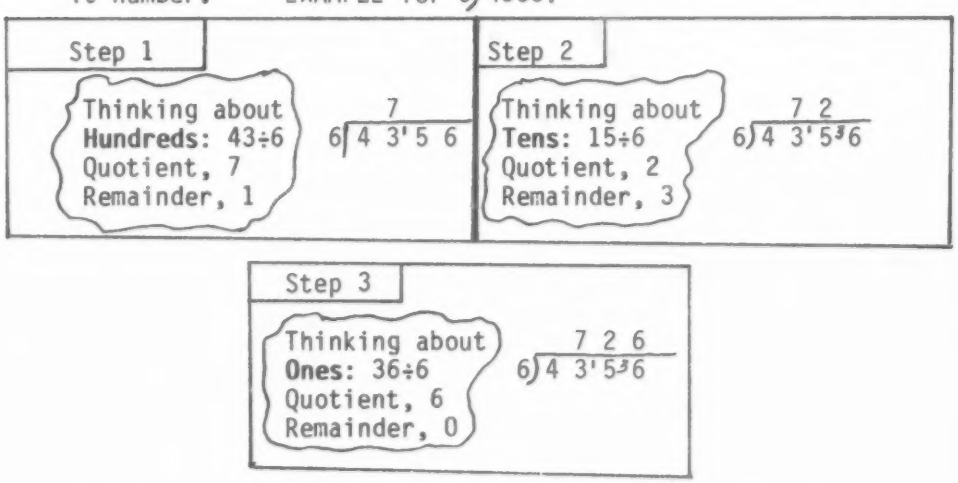
9 1109

A polyhedron is a 3-dimensional surface with each edge being a polygon. The cylinder doesn't fit this definition since the top and bottom are circles, not polygons. In your small-group session, review the definition of a polygon and a polyhedron, with concrete examples

ANSWER:

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1001 1019	Go over briefly how to compute the answer by adding, finding how much she gave the clerk, and subtracting. ANSWER: $17.98
2	1009	Ask the students which of the 3 numbers in the story would not be used in finding the answer. ANSWER: 10
3	1020	Students can either add $2.25 four times, or multiply. ANSWER: $9
4	1031	Encourage students to use a ruler to find how many centimeters Jacksonville and Miami are apart, on the map. ANSWER: 300 miles
5	1053	In your small-group session, show students how to use "short division" as shown below. Then encourage them to use it on this problem, and sometimes on class assignments, to sharpen their "mental arithmetic" muscles. This works as long as the divisor is a one-digit number. EXAMPLE for $6\overline{)4356}$:



ANSWER: 910910910 (notice pattern for easy checking)

6 1150

In reviewing this problem, be sure the children can read and interpret what each bar represents ($8000.00 in 1955, e.g.).

ANSWER: $1500.00

7 1128

Students can determine that each mark must represent 2 kg, by skip counting from 20 to 30 on the scale. They can then read the indicated mark as 34.

ANSWER: 34

8,9 1167

In your small-group session, use 68 to go through the flowchart. Your work should look like that below, as you "go through the loop" 3 times.

$$\begin{array}{r} 68 \\ +86 \\ \hline 154 \end{array} \text{ - no}$$

$$\begin{array}{r} +451 \\ \hline 605 \end{array} \text{ - no}$$

$$\begin{array}{r} +506 \\ \hline 1111 \end{array} \text{ - yes}$$

ANSWER: 8. 484
9. 2

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1148 1036	Help students read the various blood types correctly, and suggest that they can compare the sizes of various regions by using tracing paper. For example, to do (a), they might want to trace over A^+ and place it on top of O^+, to compare A^+ to 36%. You might suggest that they ask their parents their blood types, to "personalize" the chart. ANSWERS: (a) accept between 30 and 35% (b) AB^- (c) O^-
2	1006	This problem begins a series of problems (look for them on the next few worksheets) designed to help students with spatial visualization. You might build the first shape in class, and leave some blocks in a learning center for use by those who need help "seeing" a 3-dimensional figure in 2-dimensions. Suggest that they can build shapes at home also, from sugar cubes. ANSWER: Upper left, clockwise: 5, 8, 12, 10, 10
3	1081	In your small-group session, review the meaning of greatest common factor. However, do not insist that students use the method typically found in textbooks-listing all the factors of each number, and looking at the largest number in the intersection. You might suggest they jot down the prime factorization of each number, and use the product of the common prime factors. If you suggest this, give one or two examples that are somewhat intuitive to students, as are the given problems. ANSWER: 5, 9, 10, 11, 20

4 1003

In Worksheets I and II earlier this year, students were introduced to these circle diagrams. Later on, the diagrams will become more abstract, culminating in students drawing their own such diagrams to show problem situations.

In your small-group session, review the problems that use these diagrams from Worksheets I and II, replacing the names with numbers. Then consider the given diagram, and ask questions similar to those in the problem. Be sure that students understand about the inner regions--the "areas of overlap"--for the diagram.

ANSWER: (a) 47 (b) 27 (c) 13

5 1035

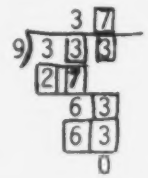
Suggest that a student might "act this out" at home, if they need to.

ANSWER: Karen can give one friend the bag with the apple inside.

6 1050

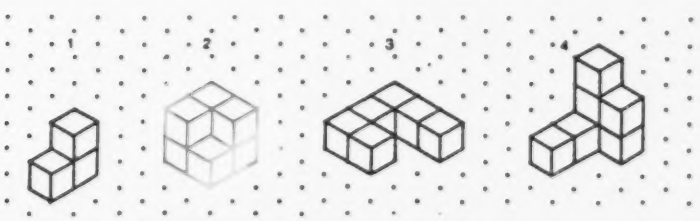
Have a student do a division problem--1 digit into 3 digits--quickly, and put the results on the board with boxes in the same places as those shown. The group together uses visual clues to find the missing digits.

ANSWER:



TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1077	In your small-group session, go over an example similar to one of these. Be sure that students know that X stands for some unknown number that they are to search for. ANSWER: (a) 8 (b) 1568 (c) 5 (d) 9
2	1005	Go through one of the "back it up" steps in this problem. Start with a bag of 8 apples, and tell them that's what was left after the last man ate 1/3 of the apples. So how many were in the sack before the last man ate his 1/3? It has to be 12, since 1/3 of 12 = 4, and eating 4 apples from a bag of 12 would leave 8. Tell the students they'll have to "work backwards" two more times, to get the total in the bag to start with. ANSWER: 27
3	1054 1168 1170	Take a similar problem in your small-group session, and show students how to accumulate the answer using M+ and M- keys on the calculator. ANSWER: (a) 355 (b) 12
4	1006	Show students how to draw each of these figures using overhead projector. They can redraw each one at home, if necessary. They can also make the solids shown using sugar cubes or wooden blocks, actually remove the shaded ones, and see if the new figure looks like their drawing. ANSWER:



5 1036 Suggest that students estimate this answer, rather than measuring it exactly and "rounding off."

ANSWER: 6 meters

6 1002 "Logic problems" of this sort were introduced in Worksheet XXII. In your small-group session, go over the similar problem below, using a chart.

The positions of treasurer, manager, and teller of a bank are held by Blake, Myers, and Jones, although not necessarily in that order. Match each person with their position. You have the following clues.

a. Jones earns more money than the manager.

b. The teller earns the least.

c. Jones married Blake's sister, and the teller is an only child.

(Ans.: Manager-Blake, Teller-Myers, Treasurer-Jones)

ANSWER: car, bicycle, motorcycle

7 -- Suggest that students finish partitioning the square, to decide the answer.

ANSWER: 7/8

8 1004 Suggest that students use a modified "guess-check-revise" approach. That is, they need only check a digit if, when multiplied by itself, yields "4" in the ones place.

ANSWER: 8

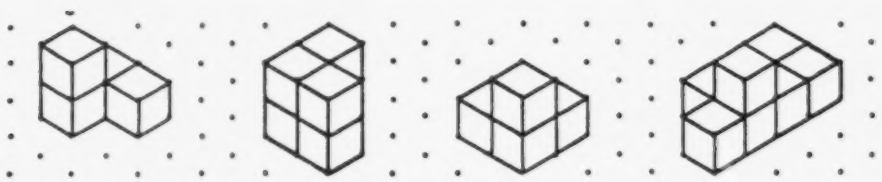
9 1053 "Short division" was introduced as an alternative to long division in problem 5 of Worksheet XXIV. In your small-group session, go over again how to do such problems mentally, recording only the answer as you go. Then give students four or five such problems to practice on at home, with the answers. (You need to occasionally have students refresh their memories on this method in the normal year's work.)

ANSWER: Have this problem taped to the table where they turn in their papers.

$$6\overline{)78230467}$$

They get credit if they write 13038411 r1 on their papers.

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1003	This problem is the last one designed to introduce students to analyzing Venn or circle diagrams to describe a problem situation. Next year they'll be expected to draw the diagrams themselves, to solve appropriate problems. In your small-group session, ask similar questions to those given in the problem itself. ANSWER: (a) 7 (b) 12 (c) 11 (d) 2 (e) 8
2	1149	Most students will easily predict that the number of deaths went down in 1981, to about 55-60. (They might be interested in knowing that they actually rose to about 110, and conjecture why.) You need to point out to them that this is an example of a good prediction--that the deaths would continue to drop--that turns out to be false. ANSWER: Accept any answer less than 70
3	1006	This is the third in a series of such problems. Encourage students to actually build the 4 shapes, physically remove the blocks, and check to see if they are correct. ANSWER: 
4	1002	This problem is the last of the series of logic problems in which children are given the chart to use. In the 5th grade, they'll be expected to solve such problems by making and completing their own charts. In your session, go over the previous such problem (Worksheet XXVI, 6) from SUPERSTARS II, all the way through. ANSWER: Treasurer, Teller, Manager

5	1125 1126	Suggest that students draw the sheet of stamps, if they are having difficulty. ANSWER: 62, 240
6	1053 1170	Demonstrate the repeating function concept present on most calculators, by going through some of the practice problems given. When students turn in their papers, have this problem taped to the table: 24 x 8 Have students do the problem on their own calculator, or one you have brought, using the repeating function concept rather than [X]. ANSWER: 192

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1169	The purpose of this problem is to have students recognize unreasonable answers, even when someone used a calculator for computation. It's impossible to judge if each answer individually is unreasonable, since you don't know if the temperature is the "high," or "low" for the day. But you can conclude that all 4, taken together, are unlikely--the winter temperature is higher than the spring or fall, and almost as high as the summer. ANSWER: Unreasonable - winter is way too high, compared with the others.
2	1001 1019	Have a student briefly describe how he or she solved this. ANSWER: $2.00
3	1003	Encourage students to draw a diagram. They may have seen a similar problem in previous years (Gr. 1, XXV, 4; Gr. 2, XXV, 1; Gr. 3, I, 2) - if not, you might start off the diagram for them, making only the first 2 day's (and night's) movements. ANSWER: 16
4	1081	This problem presents an alternate way to find the LCM, from the way presented in most textbooks (list prime factorization, etc.). While students need to learn the other, more formal method. The one presented here is more practical for the everyday use of LCM--finding a common denominator for two fractions that are relatively simple to deal with. Go over this method with them by example--encourage them to use a calculator on this problem at home. NOTE: Make sure students know what a multiple is. ANSWER: 72, 40, 15

5 1006

Suggest that students first try to visualize the cube and solve the problem without a concrete aid. But then they should take a box at home, and place the letters on there as carefully as they can in the right position, and see if they are correct.

ANSWER:

6 1050
1004

In your small-group session, suggest that students look at the "end letters" first--A and E. Carry them through the first step of deciding what the answer must look like:

$$\begin{array}{r} 2\ B\ C\ D\ 8 \\ \times\ \ \ \ \ 4 \\ \hline 8\ D\ C\ B\ 2 \end{array}$$

Suggest that they look at D and B next, and finally get C.

ANSWER:
$$\begin{array}{r} 21978 \\ \times 4 \\ \hline 87912 \end{array}$$

7 1004
1002

In your small-group session, write on the board

Sam, Suzie

Then try 1 brother for Sam, yielding no sisters for Suzie since Sam then has to have 1 sister, and Suzie is it. But then Suzie doesn't have twice as many brothers (2) as she does sisters (0), so 1 brother for Sam won't work.

Move on to 2. This won't work either; have students finish this "guess-check-revise" at home.

ANSWER: 7 [Sam has 3 brothers; Suzie has 2 sisters]

8 1002

Encourage students to make an organized list to solve this problem. First list all those that start with 1, then all that start with 2, etc., on up to 4. Then they simply count to find the number.

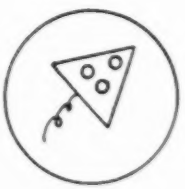
ANSWER: 17

TEACHER COMMENTARY

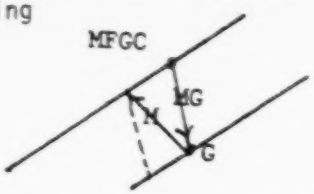
FOR

GRADE 5 WORKSHEETS

TEACHER COMMENTARY

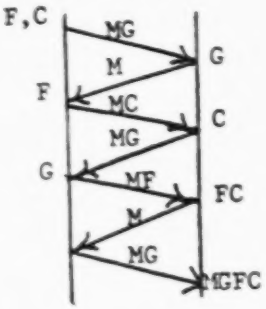
Problem	Skill of Excellence	Comment
1	1009	Have a student who has solved this problem tell what they did, without the answer. ANSWER: 173
2	1006	Encourage students to approach such problems in this way. a. Look at the top row, and write down a list of things the creatures seem to have in common. b. Look at the middle row, and modify your list, if necessary. c. Use the remaining part of your list to judge the creatures in the last row. ANSWER: 
3	1035	Students should realize that the cola would cost only 7¢, which is unreasonable. ANSWER: No
4	1125	Put one or two similar problems on the board. Encourage students to figure out missing dimensions from those that are shown. ANSWER: 18, 24

5 1003 In your small-group session, start students off on their sketches by putting



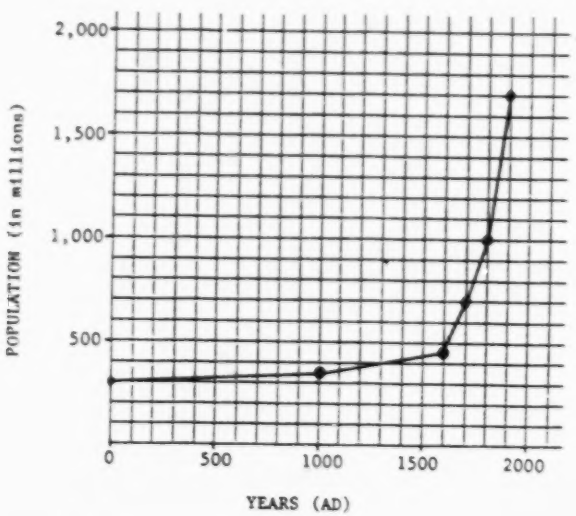
on the board, and be sure they understand what the letters mean.

ANSWER: 7 crossings, as in



6 1147 In your small-group session, show the students how to plot the first 3 points on the graph. Connect them with line segments (to ensure they know what a "line graph" is).

ANSWER:



7 1149 Discuss with students that the population is going up at an alarming rate. (Guinness predicts the population will be over 6 billion by 2000 A.D..)

ANSWER: Any answer over 2 billion will do.

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1003	This circle diagram (or Venn diagram) is a pictorial way of representing a problem situation. Later in the year, students will be expected to draw such diagrams themselves, to solve problems. In your small-group session, use the diagram given and ask similar questions that get to the main concept of intersecting regions. ANSWER: (a) 21 (b) 4 (c) 0
2	1050 1054	In your small-group session, ask students for a solution. If one exists, place the solution on the board and tell other students they have to have a different solution if they re-do the problem. If they do not produce a solution, show them this one: $[(7x3) + 4] - 5 + 6 - 10 = 1.$ Be sure they understand that parentheses must be used, and that there are "easier" solutions than the one shown. ANSWERS: These will vary. Another solution than the one above is: $(10-5) + (6-3) - (7-4) = 1$
3	1020 1002	Suggest that students who are having trouble make a chart like this, to organize their work: Days (1 2 3 4 5 6 7 8 9 10) Total A B C Fill in the first 3 days with the students--they can finish it later, on their own, and find the answers. ANSWER: Most: C Least: B

4 1110

A network is traceable if it has exactly 0 or 2 "odd" vertices. If it has 0 odd vertices (i.e., if all the vertices have an even number of paths coming in), you can start anywhere and trace it. If it has 2 odd vertices, you have to start at one of the odd vertices to trace it. In your small-group session, show this to students using examples other than the ones given in the problem. Also show then examples of networks with 4 and 6 odd vertices, and that they can't trace these without lefting their pencils.

ANSWER: A, C

5 1131

Remind students of how to use a protractor by showing them examples. Show at least one example in which they have to "extend the lines" to make them readable on the protractor. Also encourage students to estimate (more than 90°, less than 90°) the size of an angle before measuring it. This will eliminate students using the wrong scale to determine the size.

ANSWER: 40°, 60°, 80° (Give students a few degrees, one way or the other.)

6 1168

Show the first answer in your small-group session, and let the students do the last two by themselves.

ANSWER: 12 x 7 = 84 (or 7 x 12 = 84)
39 x 2 = 78 (or 2 x 39 = 78)
24 x 3 = 72 (or 3 x 24 = 72)

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1029	The purpose of this problem is to have the student estimate the answer to a whole-number verbal problem. The student might find the answer by computing first, and analyzing the answer, but hopefully they'll simply reason along the lines of: 5000 divided into 35,000 would be exactly 7 miles, but since 5,280 is a little more than 5000, the answer would turn out to be a little less than 7 miles. In your small-group session, take the students through a similar problem, with reasoning like that above. ANSWER: A little less than 7 miles high
2	1144	Have a student give the group the number of inches of snow that fell in February, to be sure everyone understands the pictograph symbol and half-symbol. ANSWER: 18
3	1148	Students are asked to take given information, and represent it in a circle graph. They can tell which food goes in which area because the largest percentage goes in the largest sector, etc. Suggest that they trace over the remaining sectors, and compare them in this manner, to decide which is 17%, which is 20%, and which is 22%. ANSWER:

4 1050
1005

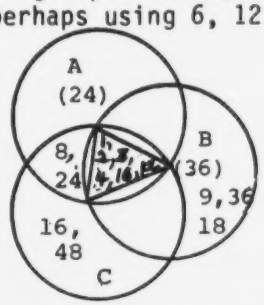
Suggest that students start with the lower left-to-upper right diagonal, since only 1 number is missing there. They can determine that number by adding 11, 12, 14 and 15, and subtracting from 65. Then they move on to another place with 4 numbers visible.

ANSWER: left-to-right
row 1; 1, 8
row 2; 23, 5
row 3; 13, 22
row 4; 10, 21
row 5; 18, 2

5 1081

In your small-group session, do a similar problem on the board, perhaps using 6, 12 and 8.

ANSWER:



6 1154
1001
1018

Have a student summarize how to do part one, and another student part two. In the last problem, remind students that they can find the tax on an amount like $83.75 by multiplying by .05. and rounding off, or by multiplying 83 x 5¢, adding that to the 4¢ tax on 75¢. Encourage them to use a calculator, but check their answer for reasonableness.

ANSWER: $3.98

7 1003

The purpose of a problem like this is to get students to visualize mentally the problem situation. Therefore, drawing a diagram, or mentally making a picture of the line of ducks, helps solve this non-routine problem.

ANSWER: 3 ducks

8 1128
1129

Students can read the scale as 27 ounces. They also need to know that 1 pound = 16 ounces.

ANSWER: 1 pound and 11 ounces

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1002	Students should be encouraged to solve this problem by making a list of the possible routes Susie could take, and then counting the number of paths in the list. Such a list might start with: A, B, D, F, G A, B, D, F, E, G and so on. There are 13 such routes altogether. ANSWER: 13
2	1022 1001	The student must correctly interpret time schedules from a chart, to solve this problem. They might need for "flying time" to be explained to them, and changes in time zones as they cross the United States. ANSWER: (a) 1 hour, 4 minutes (b) 4 hours, 53 minutes (3 hours for "time zone" change) (c) 30 minutes
3	1030	This problem has students "round off" prices to the nearest dollar, and then find the estimated sum. The second part of the problem is where they compare the estimated sum, to the actual computed cost. The estimate should be gained by adding \$15 + \$8 + \$12 + \$20; the total cost is \$14.94 + \$8.15 + \$11.88 + \$19.88. ANSWER: (a) \$55 (b) \$0.04

4 1050

The student will probably look for the digit for the "top box" first, perhaps figuring out logically what it should be, or using "guess-check-revise." Once they've determined this digit, the rest can be done by simple multiplication.

ANSWER:

$$\begin{array}{r} 4\,\boxed{5} \\ \times\ 4\ 5 \\ \hline 2\,\boxed{2}\,5 \\ 1\,\boxed{8}\,\boxed{0}\,\boxed{0} \\ \hline 2\,\boxed{0}\,\boxed{2}\,5 \end{array}$$

5 1076

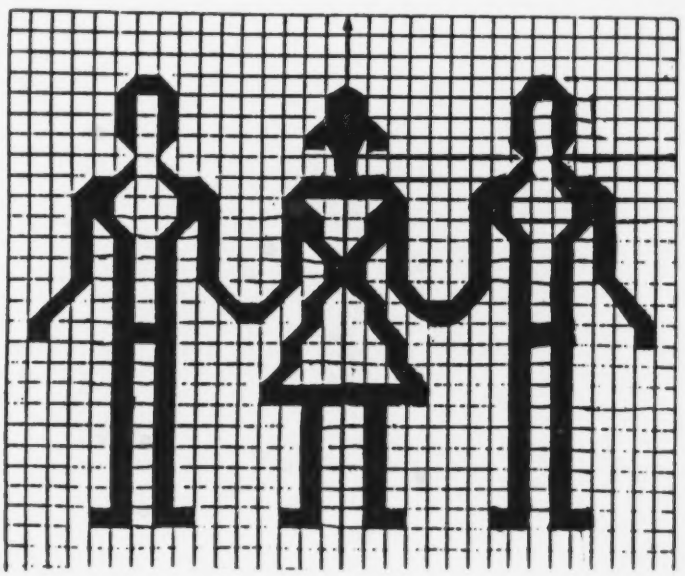
In order to solve this problem, students have to be able to classify the sum of a collection of odd numbers as either an even number, or an odd number. One way of thinking about the problem is to count and see that there are 25 odd numbers to be added, and the sum of an odd number of odd numbers will itself be an odd number. Or, a student might "pair off" the odd numbers in the list, each pair giving an even sum--but there'd be 1 number left unpaired, so the sum would be odd again. Other students might simply add all of the numbers in the list--perhaps using a calculator--to find the sum and see if it's odd or even. There are several other ways to think of the problem also.

ANSWER: odd

6 1108

In your small-group session, do part of the drawing together.

ANSWER:



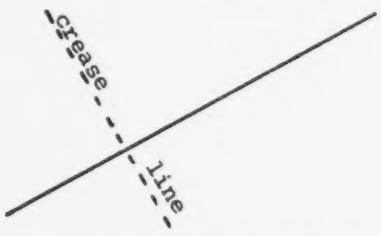
TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1007	This particular number pattern shows the consecutive whole numbers arranged in 7 columns. There are several ways that students might use to locate where 86 would be--some will simply count by 1's all the way, while others might "count by 7's" up column A, and then count over to 86. Some might notice the remainder, upon division by 7, and locate the column that way. In your small-group session, you might put up a consecutive number pattern like this, but perhaps with only 6 columns, and locate 86. ANSWER: C
2	1006 1010	The extension of the above patterning problem requires some visual discrimination on the student's part, and making a tentative hypothesis as to what the arrows might mean (and then checking this hypothesis out on the example given). If you do a similar problem for 1 above, you can use these same arrows to locate a few new numbers, but don't tell the students what the arrows mean. ANSWER: 122
3	1001 1018 1019	The student will likely add \$1.39, \$0.05, \$0.30 and \$0.65 to get \$2.39. The tax on \$2 is 10¢, and on \$0.39 is 2¢, so the total tax on \$2.39 is 12¢. When added to the previous total, the final cost is \$2.51, which is subtracted from \$5 to get the actual change received. In your small-group session, cover a similar problem and allow the students to use a calculator (as they can do at home if they re-do this given problem). ANSWER: \$2.49

4 1111
1108

This problem presents one of the traditional geometric construction problems, but in an intuitive fashion for students. They can learn about "perpendicular" and "bisector" at this time, without worrying about cumbersome instruments like a compass and protractor. In your small-group session, have them do this problem on a line segment drawn on scrap paper, and check their resulting "crease line" for accuracy using the corner of a sheet of paper (right angle) and a ruler (bisector).

ANSWER:



5 1053

Students can use this method of mental multiplication in lieu of the standard algorithm, at times. In your small-group session, have them practice doing this type of multiplication in their heads, on several problems. (Try to stick with digits 5 or less.) Encourage them to continue doing this once-in-a-while during the regular class routine.

When students hand in their papers, have this problem taped to the desk - 45x21 - and have them work it mentally, and record (or whisper to you) their answer only.

ANSWER: 945

6 1155
1156

In your small-group session, have students do similar problems to questions (a), (b), and (c). Be sure that they understand that the probability of the spinner landing on a given region is given by the ratio of that region, to the whole circle. Interpret the probability statements like 2/3 as "two out of three," rather than as "two-thirds."

ANSWER: (a) 3rd from left (b) 3/4 (c) 1/4

7,8 1124
1035

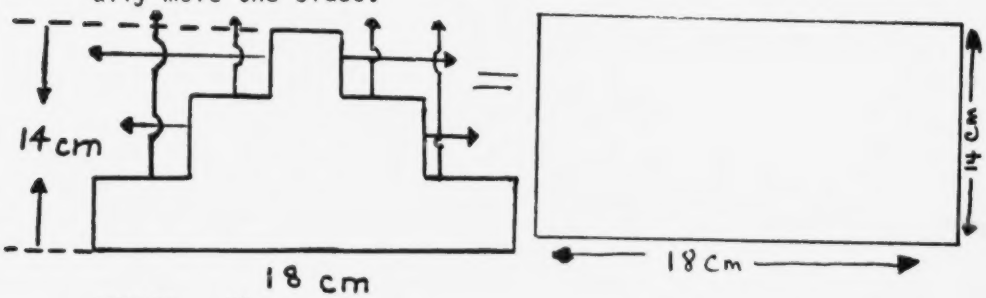
In your small-group session, it should be sufficient to discuss briefly that the given conditions will force the temperature to go "below zero" for problem 7, and how to show numbers that are below zero. For problem 8, you might suggest that students consider several familiar "benchmark" temperatures in the Centigrade scale--body temperature, etc.--rather than to try to convert to Fahrenheit.

ANSWERS: (7) The mark should be approximately at 5° below zero.
(8) summer

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1005	This is a word problem that will probably be solved by "working backward" mentally. If the pond is completely covered on the 20th day, then on the 19th day it was half covered. If it was half covered on the 19th day, it was one-fourth covered on the 18th day. If this isn't clear to students, you might have them draw a sketch of a pond, and start dividing the "lily pad area" in half, as you back up for each new day. In your small-group session, consider the same problem, but use "triples its size each day." ANSWER: 1/4
2	1035	Students are to select appropriate responses, based on personal knowledge of Celsius temperatures. If they have trouble with this, you should encourage them to remember some "benchmark" temperatures, such as 0°C. as the freezing point of water, 100°C. as the boiling point of water, and 37°C. as the normal body temperature. ANSWER: 0°C, 32°C, 100°C, 0°C, and 37°C.
3,4	1007 1005	These two problems were included so that students could look for a rule, and then "work backwards" with the rule. Hopefully students will notice that you can multiply each first number by 2, and then add 4, to find the corresponding number--there may be other "rules" that kids will discover. Be sure to accept them. In your small-group session, have students share the rules they found. If the rule discovered is the one above for problem 3, then the student would take 34 as the second number, and mentally figure out how to find the input number by reversing the "double it, then add 4" process. They'd take 34, subtract 4 from it to get 30, and then say "what number, when doubled, gives 30? "Fifteen." ANSWERS: (3) 104 (4) 15

5 1125 This problem is a challenge in that the student has to find the perimeter of the polygon, given only some of the dimensions. They may be able to visually manipulate some of the sides, knowing that their length will not change just by moving them around. If so, they can produce a rectangle with the same perimeter. If they have problems seeing how to move the sides, make such a figure out of toothpicks or matches, and actually move the sides.



ANSWER: 64

6 -- This word problem demonstrates that "key words" can be a very misleading thing to teach students. The answer is given in the problem itself.

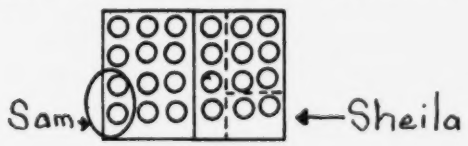
ANSWER: 64

7 -- This exercise is an interesting way for students to practice finding a fractional part of something--in this case, a fractional part of a word. The answer to the problem is "HOW DO YOU KEEP A TURKEY IN SUSPENSE?" Students will be curious about the answer to the riddle, although it's not part of the problem itself. Two such answers are:

"I'll tell you tomorrow," and
"Delay Thanksgiving one day."

ANSWER: How do you keep a turkey in suspense?

8 1001 1003 This is a multi-step word problem - if students solve it mathematically by comparing 1/6 of 1/2 to 1/4 of 1/3. Most students will use some sort of diagram or mental image of a case of cokes to help them find the number of cokes. Such a sketch is shown below:

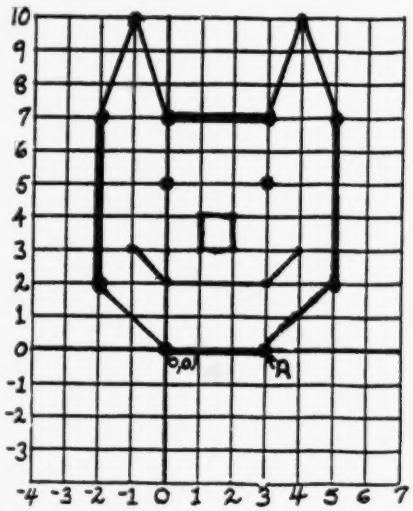


ANSWER: Neither--they had the same amount.

9 1146 This problem has students use a Cartesian Coordinate system--the problem is more difficult than many they will encounter at this grade, since there are both positive and negative numbers on the axes. In your small-group session, cover how to graph ordered pairs of integers.

ANSWER:

A = (3,0)
B = (5,2)
C = (5,7)
D = (4,10)
E = (3,7)
F = (0,7)
G = (-1,10)
H = (-2,7)
I = (-2,2)
J = (0,0)



10 1167 Students are asked to follow the logic of a mathematical flowchart in this problem. At step 2 they'll have 1089, so they'll take the "yes path" at step 3. At step 4, they'll get 1090, and then return to the decision step (3). At this time they'll answer "no" to having an odd number, and go on to step 6. They should then write "1090" as their answer. In your small-group session, use a similar number to go through the steps of the flowchart.

ANSWER: 1090

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1002 1004	To find out the type of coins, suggest that students organize their thoughts by listing: dimes nickels pennies and then using the clues to help them discover how many of each type is in the sack. They would probably start by putting 1 under the "pennies" since there is at least one such, and then 2 under the "dimes" since there are more dimes than pennies. Then they'd put 3 under "nickels" since there are more nickels than dimes. As they check, they'll find that they have exactly 6 coins, so the problem is half solved (using "guess-check-revise"). To finish the problem, they need to find the value of those coins. ANSWER: 36¢
2	1001 1023 1019	In your small-group session, go through a similar problem, perhaps using an original price of $18.99. The sale price will then be $12.66--students can find the tax on $12.66 by breaking it into parts - 5¢ x 12 = 60¢; 5¢ x .66 = 3.3¢, which merchants always round up to the next highest cent. If this last part is confusing, give them this chart to use in finding the tax on sales from $.10 to $1.09: Amount of Sale — Tax .10 - .20 — .01 .21 - .40 — .02 .41 - .60 — .03 .61 - .80 — .04 .81 - 1.09 — .05 ANSWER: $8.80
3	1079	This problem is similar to the Sieve of Eratosthenes, and can be extended past 64. It is a nice way to show students "prime" vs. "composite" numbers. In class, mark out the multiples of 2 and 3, and let the students finish the problem at home. ANSWER: 18

4 1080

Go through the problem using 56 instead of 60. Students should first "break down" 56 into 7 x 8, then break 8 down further into 2 x 4, and eventually into 2 x 2 x 2.

ANSWER: 60 = 2 x 3 x 2 x 5

5 1001 1009

This problem involves several computational steps and extraneous information. The distracting number, unused in the problem, is "6 miles."

The student will probably divide 30 by 5, to find that Jake goes 1 mile in 6 minutes, and then multiply 6 by 3.

ANSWER: 18 minutes

6 1036

Surprisingly to most students, the circumference of the tire will be longer than the length of the bike. They might solve this merely by observation, or by estimating since it's difficult to actually measure the bike tire itself. (Creative methods for doing so--using a coin the same size, and rolling it, etc. should be encouraged.)

ANSWER: The circumference of the tire is longer.

7 1031

If the students do not have legible maps with readable numbers, put this chart on the board and be sure the students know about it:

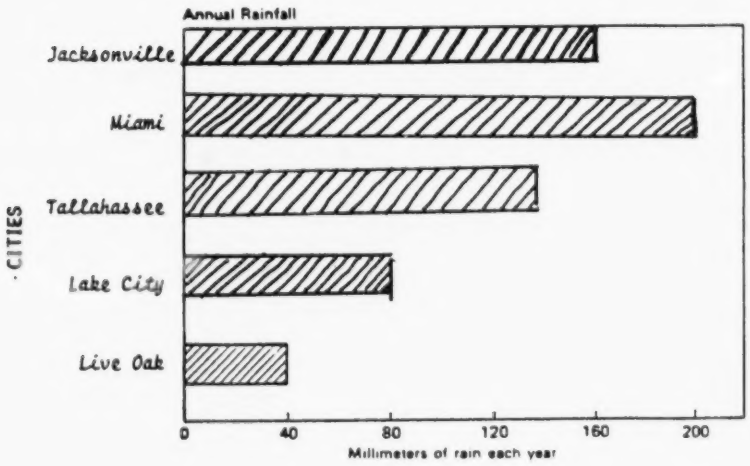
From:	To:	is this distance:
Los Angeles	Dallas	1995 km
Dallas	Atlanta	1160 km
Memphis	New York	1540 km

This situation forces the student to estimate a given, length, using some other lengths that are close to the one in question. The student will probably find 2 other cities that are about as far away as Phoenix is from Chihuahua--perhaps Dallas and Atlanta--and reason that the distance must be smaller than 1400.

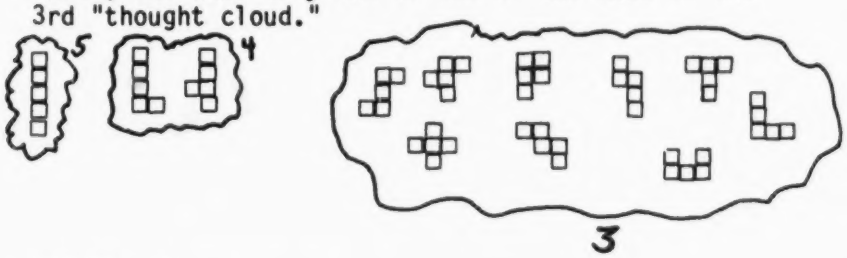
ANSWER: 1000 km

8 1145 Constructing bar graphs is covered in this problem. The student has to use "Live Oak" as the base number, and calculate the others from it. In your small-group session, go through making the bar for Lake City and Miami.

ANSWER:

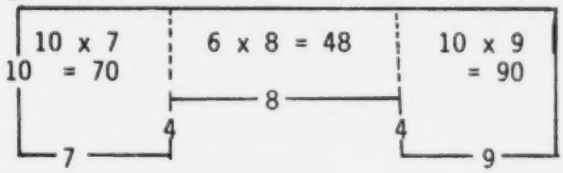


TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1006 1003	This exercise allows the student to demonstrate visual discrimination skills in problem solving. A piece of graph paper helps in drawing the pentominoes, and students will use various methods of searching for the whole group. Some will just draw figures at random, hoping to find them all--these students probably won't be successful, but this inefficient method will sometimes work. Other students will organize their work along the lines of: I'll start with all the shapes that have 5 squares in a row. Then I'll draw all that might have 4 in a row, and 1 "sticking out." Then I'll move on in this fashion. Show students how to begin this type of search by finding, as a group, the first two "thought clouds" below, and then only one or two of the ones in the 3rd "thought cloud."  ANSWER: 12
2	1003 1004	Many students will solve this problem either concretely (taking out 20 objects, and putting them in piles to match the clues) or by "drawing a diagram." In either case, determining the correct number of cubes in each pile will probably be done via a modified "guess-check-revise." The student will guess the number in the piles, to see if they match the clues. If not, they'll make adjustments until they find the answer by "happening onto it." ANSWER: [8] [4] [6] [2] 1st 2nd 3rd 4th

3 1126

Students can demonstrate their knowledge of finding the area of a figure made of rectangles in this problem. There are several different methods of partitioning the given figure into rectangles, finding the area of each, and then adding the "sub-areas" together to get the total area. One such method is:



In your small-group session, go through this partitioning and finding 2 of the areas, without finding the 3rd or the total (but hinting at how to do it).

ANSWER: 208
Another way to find the area is to determine the area of the larger outside figure (10x24), and remove the "cut away" piece (8x4).

3.5 1004

This problem will most likely be solved by "guess-check-revise"--the student will guess at the first number, then add on the next 2 and see if the sum is 189. They'll then increase or decrease the first guess to account for their new knowledge about the size of the first number. Other students might find the answer by doing 189 - 3, to get the middle number first.

ANSWER: 62, 63, 64

4 1046

Perhaps the most efficient way to proceed, although it's laborious itself, is to find a list of the 50 states, and calculate the value of each and find those that fit the categories. Another way, particularly for the (a) and (c) parts, would be to "guess" states that would have small or large values, depending on both the number of letters of each, and where those letters come in the alphabet.

ANSWERS: a. Alabama (31¢) and Idaho (37¢)
b. Illinois (99¢)
c. Massachusetts ($1.68)

5 1168
1170

The student must use a hand calculator to find the answers to these problems, since the calculator "spells out" the answer, on the display. For parts 7, 11, and 18, the student must also demonstrate knowledge of the calculator's input keys, since the $\sqrt{}$ symbol in arithmetic must be changed into the $\div$ key on the calculator. Do the first 3 in your small-group session, to be sure students recognize which letters the "upside down" numbers represent.

Be sure to mention in the discussion that these problems are intended to be done from left-to-right. But in an algebra course, or if these expressions were evaluated by a computer, parentheses would be necessary to demonstrate which operations (+, -, x, or -) to do first. If the parentheses were left out, the computer or algebra student would evaluate them in this order:

x, -, +, -

This would give different answers for many of the problems.

ANSWERS:

1. Bill
2. his
3. Boise
4. He
5. He
6. logs
7. hogs
8. geese
9. bees
10. goose
11. she
12. bell
13. sleigh
14. Bill
15. sleigh
16. hole
17. shoes
18. ill

6 1006

The student is encouraged to use spatial visualization to solve this problem. Suggest that they might also solve it, or check their work, by actually cutting the figures out and folding them, to see what happens.

ANSWER: A and C give cubes

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1020 1001	Have a student share how he/she computed the answer to this problem, and then ask if there was another way. Two ways are: (a) [40 x ($3.50)] - [40 x ($3.25)] and (b) [40 x ($3.50 - $3.25)] You can put these two on the board, and point out the Distributive Property of Multiplication over Subtraction. ANSWER: $10.00
2	1003 1002	Suggest that students solve this either by drawing a diagram, or by making a list (AC, AD, etc.) and counting. ANSWER: 40
3	1022 1123	In your small-group session, compute 2 of the times in the chart, and let the students compute the other two at home. ANSWER: Tampa to Los Angeles
4	1168 1032	Remind students that they don't have [√] on a calculator, so they have to use [÷] . But this means entering the numbers in the reverse order in which they see them. ANSWER: 0.79
5	1050 1005	Students can find the total for each row by looking at the last one (313 + 291 + 290 + 316). Then they can mentally "work backwards" in places where they know 3 of the 4 numbers, to find the fourth. ANSWER:

289	315	314	292
308	298	299	305
300	306	307	297
313	291	290	316

6	1127	Have a cardboard box in class, without a top, and have students find its surface area using a calculator. Remind them that they're just to cover the <u>outside</u> of the box. ANSWER: 608
7	1127	Find the volume of the cardboard box also. ANSWER: 1280
8	1111	The purpose of this problem is to introduce students to the concept of bisecting an angle, without having to worry about a compass or straight-edge. In your small-group session, have students draw an angle on scratch paper, and bisect it using the paper-folding method. ANSWER: Look to see if the fold line is close to bisecting the angle.
9	1131	Have students measure each half of the bisected angle above, using a protractor. This will let them know if they are correctly folding the paper, and if they can correctly use a protractor. ANSWER: The 3rd answer down should be bubbled.

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1170	This problem can be used to introduce LOGO to your students. The hint is written in a mirror image--they can hold it up to a mirror to see what it says. (Leonardo di Vinci used to write all his notes on his science inventions this way.) In your small-group session, demonstrate these major LOGO commands on the board: "Forward 60" means move forward 60 steps. "Right 45" means turn right (clockwise) 45°. "Left 60" means turn left (counter-clockwise) 60°. "Back 30" means to move back 30 steps. Put them together with various numbers to produce a picture. ANSWER: B
2	1128	In your small-group session, have a similar problem drawn on the board. Students should gain the estimate by visually breaking the segment from 90 to 100 into pieces. ANSWER: 95 kg
3	1002	Suggest that students make a list of this sort, to organize the approach to the problem. Make the first few entries together, as a group: Group number: Bill, 2, 3, 4, ., ., ., 19, 20 People in group: 1, 3, 5, 7, ., ., ., 37, 39 Also, to add these up, notice that 1+39=40, 3+37=40, 5+35=40, etc. There are ten such subtotals of 40? ANSWER: 400

4 1021
1001

Suggest that students having difficulty use a calendar to help them.

ANSWER: 1 week

5 1036

NOTE: Check to see if the numbers are legible, if not, put on the board the distance from New Orleans to Dallas is 797 km.

Show students how to mark off the distance from New Orleans to Dallas on a sheet of paper, and use that as 800 km. They then estimate the other distances, and whether they go through Denver or through Phoenix, they should get around 5000 km.

ANSWER: C

6 1166

Act out this flowchart in class, for a "spend the night" party with 3 guests. Be sure students understand what part of the flowchart makes up the loop.

ANSWER: B D A C (Note: B & D could be reversed in order.)

7 1002

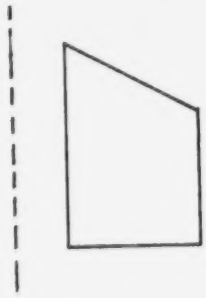
Suggest that students complete this list at home, if they want the stars:

APH
ABP HFG
ABH HOG
AJC HMF
AIG MDF
BCN GOF
BCD FQE
BDF DQE
BDM DFE
BMH CKE
BFH GLE
HDF CDN
BDH

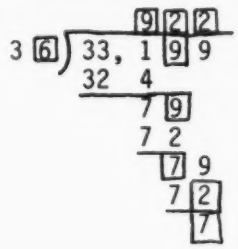
ANSWER: 24

8 1108 Suggest that students actually fold the sheet of paper on the dotted line, and trace the figure they see. Or they can trace the figure on another sheet of paper, cut it out, and flip it and trace the new figure. Remind them that the distance of a point from the fold line must be maintained in their new drawing.

ANSWER:

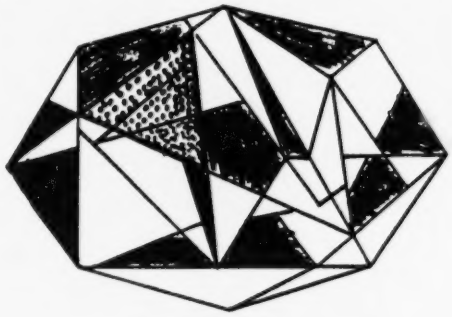


TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1009	In your small-group session, ask students which number in the problem is not used to find the answer. ANSWER: $936.00
2	1018 1004 1005	Ask a student who solved the problem to share how he/she approached it. They probably just "guessed-and-checked" till they found two items that added to $1.94. ANSWER: Cheeseburger and soft drink
3	1035 1037	Suggest that students look at a cola can to verify their choice. ANSWER: 354 ml
4	1050 1005	With the group, analyze how to find the digits by looking carefully at the clues present. One place to start would be to notice that 3□ x □ has to yield 72 (second step). This means that thirty-something times some digit has to be 72. Students can figure that the missing single digit must be 2, so the missing digit in "3□" must be 6. I.e., 36 x 2 = 72. From this hint, they should be able to finish the puzzle. ANSWER: 
5	1078 1054	Go over a similar problem in your small-group session. Be sure students read "X" as the alphabetical letter, and not "times." Also be sure that students understand "$\leq$," and that they know to compute within the parentheses first. ANSWER: A

6	1123	This simple problem will be no problem for the student. Remind them of how to "borrow" in a problem like "9:15 - 6:45." ANSWER: 2 hours 30 minutes
7	1150 1001	In your small-group session, find the total number of people who visited 5th grade for the 5-year period. Discuss briefly how to finish the problem. ANSWER: 10
8	1168 1054	Consider a similar problem in your small-group session. Show students how to use the memory unit on a calculator to store and recall partial computations within the parentheses. ANSWER: 3438.25
9	1006	Students perhaps have seen this problem on a 4th grade worksheet. Take the opportunity to extend the problem beyond the 4 years shown, to 5 years, 6, 7, etc. Then conclude by asking a question that calls for a conjecture on their part - If there were 100 years, which way would the last one turn? 101 years? (Suggest they look at odd vs. even numbers.) ANSWER: Counter-clockwise

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1109 1006	This problem reinforces "equilateral triangle" in a way that's interesting for students (and teachers), and also involves visual discrimination. Suggest to students that one way to find the hidden triangle is to take a 60° angle (made from cardboard, or from a template, etc.) and go to all the points and look for the triangles that have such an angle. You'll find several such like this, but only one of them turns out to have all three sides the same length, and therefore all three angles 60°. Students would enjoy discussing this point. ANSWER: 
2	1001 1020	Have a student who has solved this problem briefly tell his/her method. You might point out to students that they can calculate 1/5 of the money and subtract, or simply calculate 4/5 of the money. ANSWER: $28
3	1125	The student should be able to find the length of the missing sides, by using those that are there. The "top" of the figure, for example, is the same as the three "bottom" pieces, or 10+10+10 cm. The right side is the same as the left side--10 cm. So the perimeter is the sum of all of these--88 cm. ANSWER: 88

4 1004

Most students would solve this by "guess-check-revise." They would take one of the conditions--that the length times the width would have to yield 48, perhaps--and check out pairs of numbers like this, to see which pair also resulted in a perimeter of 32. They might guess number pairs like:

6 and 8; 6x8 = 48, but 6 + 8 + 6 + 8 = 28 (nope)
24 and 2; 24x2 = 28, but 24 + 24 + 2 + 2 = 52 (nope)
12 and 4; 12x4 = 48, and 12 + 12 + 4 + 4 = 32 (Eureka)

In your small-group session, go over a similar problem --a rectangle with perimeter = 34 and area = 30.

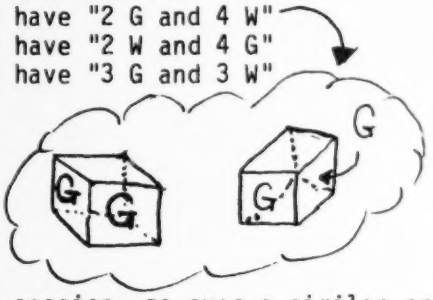
ANSWER: 12, 4

5 1006

This problem provides a real opportunity for students to show spatial visualization. If they're having trouble with this, you can take some cubes--sugar cubes work well or unifix or multi-links--and go through the experiment with them, coloring the green faces with a magic marker, and leaving the white ones alone. Do only three or four cubes of those listed below, and let the students finish them at home. What students will find is this:

1 way to have all white faces (6 w)
1 way to have "6 G"
1 way to have "1 G and 5 W"
1 way to have "1 W and 5 G"
2 ways to have "2 G and 4 W"
2 ways to have "2 W and 4 G"
2 ways to have "3 G and 3 W"

ANSWER: 10 ways



6 1031

In your small-group session, go over a similar problem: "Suppose Florida was 580 miles wide and 720 miles long. What would be the smallest size paper you could use?"

ANSWER: 2 (4 in. by 4 in.)

7 1153 1155 1156 1157 Have a student go through the experiment in front of the group for one trial. (If 10 feet is too close to get good data, have the student move back to 15 feet, or use their non-dominant hand.) Then fill-in made up data for the other nine trials, and complete the problem.

ANSWER: To judge their experiment, add the "shots made" list, and divide by 10. Round off the answer to the nearest whole number. The answer recorded in the first box, then, should be this whole number, over 10. The answer in the second box would by 10 - (this number), over 10.

Example: Suppose the "shots made" list totals 57. 57 - 10 = 5.7, which is rounded off to 6. The answer in the first box, then, would be 6/10. The second answer would be 4/10.

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1006	Suggest that students who have trouble visualizing this, or want to check their answer, actually make such a die at home (using most any type of box). ANSWER: The cube to the far left.
2	1167	Go through the steps of the flowchart with such a 3-digit number, but don't give the final answer. (Any such 3-digit number produces 1089 as the final answer.) ANSWER: 1089
3	1054	Review briefly for students the use of parenthesis in mathematics. Show them how a problem like "17+(8x4)" gives a different answer if you "do what's in parensis first," than if you ignore the parenthesis and do the operations in the order in which they appear. ANSWER: A PIANO
4	1126	This problem supports the skill of finding the area of a geoboard figure by counting unit squares and half-squares. Counting the edge points and boundary points was introduced primarily for the problem that follows. In your small-group session, go over finding all the missing numbers in the chart--students won't remember all of them, so they won't be getting too much help.

ANSWER:

Fig.	Edge pts.	Inside pts.	Area
B	15	0	6 1/2
C	14	5	11
D	13	9	14 1/2
E	16	2	9
F	22	38	48
G	31	35	49 1/2
H	23	1	11 1/2

5 1010 The purpose of this problem is to have students conjecture a tentative hypothesis--how to find the area of a geoboard-type figure, if you know the edge points and the boundary points. The formula is known as PICK'S FORMULA. In your small-group session, bring to their attention that in B, (14 - 2) + 5 - 1 = 11, and in C that (13 - 2) + 9 - 1 equals 14 1/2. Encourage them to "play around" with the table in this fashion, at home.

ANSWER: Divide the edge points by 2, add the number of inside points, and subtract one. (Any answer that's equivalent to this one is acceptable.)

Grade 5 , Worksheet XIV

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1007	Suggest that students having trouble with these patterning problems try several new approaches, such as: (1) Say the pattern out loud. Sometimes hearing it verbally helps. (2) Write the elements of the pattern vertically instead of horizontally. This is sometimes useful in a pattern like (f). The only one that might stump students is (g), which adds 1, then 2, then 3, then 4, etc., to get the next numbers. ANSWERS: (a) 10 (e) 45 (b) 9 (f) D_7 W_{20} (c) 12 (g) 11 (d) 19 (h) 1/16
2	1079	Review with your students what constitutes a prime number, and list the first few primes. ANSWER: (a) P (b) (c) P
3	1029	In your session, remind students that an estimate is not an exact answer. The best way to estimate a straight computational problem is to round off and compute. Go through a similar problem in class. ANSWER: (d) 16,000 (Note: (c) is the answer a student would get if he/she computed the exact answer. It's not an estimate.)
4	1124 1001	Consider a similar problem, with a thermometer that shows 60° and rises 1/3 of what it was previously. ANSWER: The second thermometer should show 75°.

5 1155

This problem involves the chances of an event occurring. The chance of drawing a black from A is 3/5, and from B is 2/3. Therefore, the question is, which fraction is larger, 3/5 or 2/3? A common denominator of 15 helps:

$$\frac{3}{5} = \frac{3 \times 3}{5 \times 3} = \frac{9}{15} \quad \text{and} \quad \frac{2}{3} = \frac{2 \times 5}{3 \times 5} = \frac{10}{15}$$

since 10/15 > 9/15, 2/3 > 3/5, so bag "B" gives the best chance. In your small-group session, carry students only to the point above where they know they must decide which is greater, 2/3 or 3/5.

ANSWER: Bag "B" has the best chance.

6 1146

In your small-group session, review how to locate ordered pairs when both positive and negative numbers are involved. Then take them through finding the first word--Florida.

ANSWER: FLORIDA STUDENTS ARE STARS.

7 1007

Most students will recognize this simple doubling pattern.

ANSWER: 64 512

8 --

After students have considered a lot of patterning problems, they need to confront a problem that looks like a pattern, but which has another underlying rule. This keeps them from developing a "mind set" about every sequence they see having an underlying mathematical basis, when some situations will have other logical bases.

In your small-group session, give them the hint that not every sequence of alphabetical letters would be based on a numerical pattern. Some might have other "scientific" explanations.

ANSWER: P (for "Pluto")

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1110	This problem is from the area of geometry called "topology." The strip made with a "half twist" is called a "Moebius strip." It has some very interesting features, among them being that it only has 1 side, and 1 edge. The purpose of this problem is to bring out this feature through trying to color it--a student will wind up with the whole thing colored, even though he or she started out with the intention of coloring only 1 side. A Moebius strip has some practical applications also--film loops, continuous-play cassette tapes, escalators, etc. This one experiment with the Moebius strip only scratches the surface of some very interesting, easy-to-do classroom experiments with this area of topology. In your small-group session, go through the entire experiment. ANSWER: The student should circle either one of the 2 Moebius strips, to get the stars.
2	--	The purpose of this problem is to solve an algebraic inequality, at the intuitive level. In your small-group session, consider 2 or 3 similar problems, noting that you don't have to compute an exact answer for X to be able to judge the question asked. ANSWER: less than

3	1053	An alternative way to multiply whole numbers is demonstrated in this problem. The method is similar to the usual algorithm, except that the top number is used digit-by-digit as the multiplier, instead of the bottom digits. This gives the same answer as with the normal algorithm, since the Commutative Property of Multiplication says that 42 x 38 is the same as 38 x 42. Either number can be used as the digit-by-digit multiplier. In your session, go over the method using an example other than the given one.

ANSWER: To get credit, not the final step, but the intermediate steps, must be correct. They must be:

```
  14          31
x 26        x 53
-----       -----
 104          53
 26         159
-----       -----
 364        1643
```

4,5,6	1154	These problems allow a student to deal with measures of central tendency--mean, median, mode--for a set of data. The average is the only one of the three typically taught to students in the elementary grades, but the other two are also important, and are easy to learn. In your small-group session, review briefly how to find these 3 measures, for a set of scores.

ANSWERS: 4. 11 and 9
5. 10
6. 9

7	1001 1009	Suggest to students that all of the numbers that appear in the problem might not be necessary in finding the answer.

ANSWER: 9

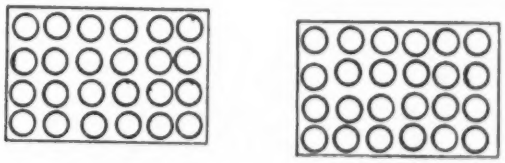
8	1055	The problem can be solved by finding a common denominator for the fractional part of the mixed numbers before adding and subtracting. The best denominator to pick in such a case would be 4. Notice that some students will find the answer an easy way, by observing that the "halves cancel out" in the first four numbers, and the "fourths and half out" in the last 3 numbers. Therefore, the only things to really consider are the whole numbers. ANSWER: 3
9	1006	Point out to students how the movement of these dials is similar to the years on Worksheet XI, problem 9. Encourage them to look at the way the numbers increase (clockwise vs. counter-clockwise) to determine if the pointer is greater than, or less than, a number it is pointing toward. ANSWER: B

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1001	Have a student who has solved this problem briefly discuss the computation he/she did, and what each computational step represents. ANSWER: 55,224 ml
2	1001	Again have a successful student discuss his or her approach to this problem. ANSWER: 45¢
3	1023	Show students how to find 1/8 of \$16 by drawing sixteen \$1 bills, and partitioning it equally into 8 sections. Then since 1/8 = \$2, 3/8 = 3 x 1/8 or \$6. So the glasses cost \$16 - \$6. ANSWER: \$10 (Or \$10.50, if tax is added.)
4	1051	Suggest to students that they can decide either by combining the fractions using a common denominator, or by reasoning logically (3/8 > 2/8 and 2/4 > 1/4), so 3/8 + 2/4 (>) 2/8 + 1/4. ANSWER: greater (>)
5	1076	In your small-group session, mention that this problem is in the same category as trying to decide these questions: odd + odd = ? odd x odd = ? even + even = ? even x even = ? even + odd = ? even x odd = ? Show them how to decide intuitive answers to the questions above by trying various examples. Suggest that they do the same thing at home. ANSWER: odd

6	1130	Show students how to do several similar problems using the metric system. ANSWER: 2000 m, 1.5 km
7	1148	In your small-group session, ask students how to find percentages like "30% of 10" or "70% of 10." ANSWER: 6
8	1002 1004	Suggest that students start by trying various numbers of pennies first. There couldn't be 50 - that would be all the coins and hence not add up to $1. Students can rapidly figure out that there couldn't be 49, 48, 47, or 46 pennies, so they try 45. This will work, if they manipulate the other coin values correctly using "guess-check-revise." ANSWER: 45 pennies, 2 nickels, 2 dimes, 1 quarter
9	1003	This problem extends problem 2 from Worksheet IX. Hopefully, the students will remember to draw a diagram to solve the problem. Suggest that they check their answer by labeling the vertices A,B,C,D,E,F, and making a list of the diagonals, and counting the list. ANSWER: 9
10	1001	Have a student who has solved the problem describe the computation he or she did. More than likely they multiplied 12 by 50 to get the girls' weight, and subtracted that from 1020 to get the total of the boys' weight. They then would divide by 6. ANSWER: 70 pounds

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1006 1127	In your small-group session, have a model like this built from cubes, and discuss briefly the concepts of volume and surface area. Have the students discuss ways to find the number of cubes with 3 faces painted (using a magic marker perhaps). ANSWER: (a) 30 (b) 61 (c) 8
2	1001 1018 1019	Go over problem (c) with your students, in the small group. They can use 5% to find the tax, or you can provide them a tax chart. ANSWERS: (a) \$2.51 (b) \$2.16 (c) \$2.67 (d) Roast beef sandwich and small coke
3	1001 1003	Suggest that students who are having trouble draw a diagram of 2 cases of cola, one for Sam and one for Sheila.  They can partition the diagram to show how each case of 24 colas would be divided. ANSWER: None. (They had the same amount.)
4	1078	In your small-group session, go over a similar problem. Show them how they can start with the set $x = 68,69,70,\ldots$ that satisfies the first inequality, and then impose the second condition to refine the set to numbers that satisfy <u>both</u> conditions. ANSWER: $x = 68,69,70,\ldots,83$

5	1108	Go through the same problem with students, but for a rectangle or square instead of the given triangle. ANSWER: 3 lines of symmetry.
6	1123	Encourage students to "count forward" from 7:01 AM to 8:40 PM, first by hours and then minutes, instead of trying to subtract. ANSWER: 1 day, 13 hours, 39 minutes (or 37 hours, and 39 minutes)
7	1155	Use a deck of cards, and have two other "up cards" showing (perhaps a 6 and Ace). Be sure students know there are 50 cards remaining. Separate them into 2 stacks, those that are <u>between</u> 6 and Ace, and those that aren't. Then write the probability as the ratio (fraction) of "those between 6 and Ace," over the total number left (50). Do <u>not</u> stress reducing to lowest terms. ANSWER: 20/50 (or 2/5)
8	1032	In your session, briefly review rounding off to the nearest hundredth. You might use a meter stick (1 m = 10 dm = 100 cm = 1000 mm) as a concrete example of rounding off to 2 decimal places. ANSWER: A balanced diet

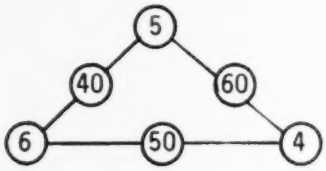
TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1123	In your small-group session, consider a similar problem to the given ones. You might want to discuss, in terms of the movement of the sun, why we have time zones throughout the United States (and world). ANSWER: a. 5:45 PM b. 8:45 PM
2	1001	Students considered a similar problem on worksheet XVI, but with different numbers. Use the problem from that worksheet to show the computation to be done. ANSWER: 65 pounds
3	1006 1127	Make such a cube for your students, and have them describe a way to answer all of the questions concretely. Encourage them to try to visualize the answers first at home, and then make such a cube and verify their answers concretely. (Note: In a similar problem in the previous worksheet, the bottom of the figure was not painted - be sure students know it is painted here.) ANSWER: a. 8 (corners) b. 12 (mid-edge) c. 6 (center of each face) d. 1 (center of whole cube) e. 54 (8 x 3) + (12 x 2) + (6 x 1)
3.5	1006	Extend the cube you made for problem 3, to have one with 4 cubes per edge. But don't let the students count them as you go. Encourage them to draw such a cube at home, and see if they can figure it out from their drawing. (If not, they can make a concrete model from sugar cubes.) ANSWER: 64

4 1004

Ask students <u>why</u> they have to put the larger three numbers in the triangle so that no two will be multiplied together. This should be enough of a hint.

ANSWER:



5 1035

Discuss with students some "bench mark" metric measurements they can use to estimate reasonable answers to similar questions as the ones given. Expect suggestions like:

- I'm about 1 to 1 1/2 meters tall.
- My own mass is about ___ kg.
- A 2-liter bottle of cola is 2000 ml.
- 0°C is freezing, while 100°C is boiling water.

ANSWER: a. 97 cm.
b. 3200 g.
c. 360 ml.
d. 10°C

6 1156
1009

Students can find this complimentary probability by counting the unsuccessful ways it can happen (4), over the total number of ways (5). Go over a similar problem in your small-group session, adding a couple of more drinks and asking what are the chances of <u>not</u> getting a Pepsi, Coke, or R.C. Discuss the fraction produced as something like "4 out of 7" rather than "four sevenths."

ANSWER: 4/5

7 1050

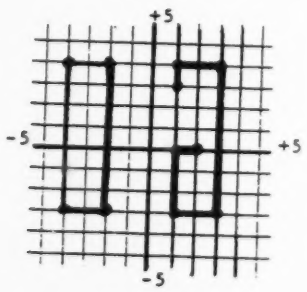
In your small-group session, discuss why 6 is a perfect number, and then try briefly to find one between 6 and 12 (there isn't one). This should impress students that these numbers are really quite unique.

ANSWER: 28

8 1146

Review with students how to graph ordered pairs of integers. Then graph a few of the given points for this problem, out of the order given.

ANSWER:



TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1050	The key part of this puzzle is figuring out the missing digit in the divisor--after that, the puzzle is nothing more than computation. Ask a successful student how they figured out what digit it was - "guess-check-revise," or through logical deduction? ANSWER: $$\begin{array}{r} 1\,2\,6\,7 \\ 6\,5\overline{)\,8\,2\,3\,7\,1} \\ -6\,5 \\ \hline 1\,7\,3 \\ -1\,3\,0 \\ \hline 4\,3\,7 \\ -3\,9\,0 \\ \hline 4\,7\,1 \\ -4\,5\,5 \\ \hline 1\,6 \end{array}$$
2	1007 1002 1010	Suggest that students begin by filling in a chart like: Which Square Number: 1, 2, 3, . . . Number of Dots: 1, 4, 9, . . . They can then guess what the next few square numbers would be, and verify their guess by actually making the right dot diagram. The student will have to conjecture that the number of dots for the 18th square number is 18 x 18, or 18^2, because it will be too hard to make such a figure. ANSWERS: a. 16, 25, 36, 49, 64 b. 324
3	1050	In your small-group session, take the opposite problem for consideration--how would you use the 5 digits to get the <u>smallest</u> possible product. Allow calculators. ANSWER: 921 x74

4 1126

Suggest that students draw a cm^2-grid over the figures. Tell them that the corner points of the figures are supposed to turn out to fit such a grid exactly.

ANSWER: (a) 10
(b) 2
(c) 9 1/2
(d) 1/2

5 1148

Ask a student to tell how he or she found the percentage for A? (A is 1/4 of the circle, which is not obvious because of the way it is "turned.") So A = 25%. Suggest that they can then find B since the whole circle always represents 100% in a circle graph.

ANSWER: a. 25% b. 35%

6 1131

Review briefly with students how to measure an angle with a protractor. Remind them to use "bench marks" in making good estimates, to avoid reading the protractor incorrectly. The bench marks they should learn are 90° and 180°.

ANSWER: 35°

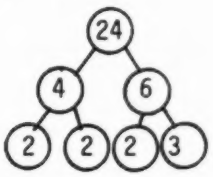
7 1170

If you have a classroom computer, type in such a program and actually run it. It should then be obvious that "We have art today" is skipped.

ANSWER: Line 40

8,9 1080

Show students how to find the prime factorization of a number using a "tree diagram" in which you break a composite down into the product of primes through several steps.



so 24 = 2 x 2 x 2 x 3

If they have trouble finding factors to start with, encourage them to divide by 2,3,5,7,etc., in order to find the lowest. You might start with 91 as an example. 91-2, 91-3, 91-5, 91-7=13, so 91=13x7.

ANSWER: 8. 2 x 2 x 3 x 3
9. 3 x 17

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1033	In your small-group session, show students how to look for the largest number, and then "add on" the others in order, but only the important parts. Take 3 or 4 similar problems in class--use the same containers, but change the decimal points to get new numbers. If necessary, give them a few practice problems of this sort for homework. When they turn in their papers, have this problem taped to the table. They can only use their pencil to write their choice. Luis had four cartons of milk. Each carton contained the amount shown on the cartons below. Luis poured all four cartons into a larger container. Which size container comes closest to holding all four cartons? a) 10 liters c) 20 liters b) 15 liters d) 25 liters ANSWER: (a) 10 liters
2	1037	This problem involves checking the results of a problem-solving attempt in terms of the original problem. The answer is <u>not</u> reasonable because it does not fit the situation provided in the problem. Possible explanations may include: $.50 x 15 = $7.50, but he did not have to pay $.50 for each of the 15 pens. The answer should be less than $7.50, because each second pen only cost 1¢. - or - 50¢ + 1¢ + 50¢ + 1¢ + 50¢ + 1¢ + 50¢ + 1¢ + 50¢ + 1¢ + 50¢ + 1¢ + 50¢ + 1¢ + 50¢ = (8 x 50¢) + (7 x 1¢) = $4.00 + .07 = $4.07. - or - 1/2 of the pens (about 8) cost 50¢. The other half cost only 1¢. So, the answer should be a little more than 8 x 50¢ ($4.00). ANSWER: <u>√</u> no

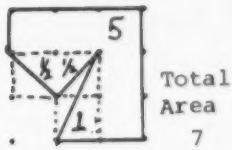
3 1126 In your small-group session, introduce students to two new methods of finding the area of geoboard figures, when the figures are difficult. Use different figures than the ones in this problem.

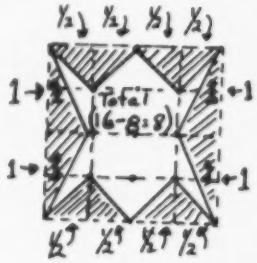
Method I: Make a rectangle around the outside of the figure; find the area of the rectangle, and then remove from the rectangle pieces that aren't part of the figure.

Example: Area is the area of the rectangle around it (2) minus 1/2 and minus 1.

Using this method, you can find the area of the given figures like this:

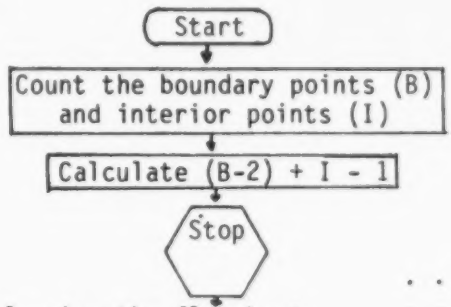
METHOD I





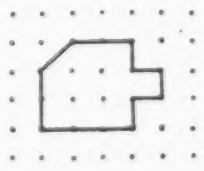
Method I is the basic way of finding such areas, since it doesn't rely on remembering a formula. However, students were introduced intuitively to Pick's Formula in problem 4 of Worksheet XIII.

Method-II:



Examples of using the flowchart:

Boundary points = 13
Interior points = 4
(13-2) + 4 - 1 = 6 1/2 + 3
= 9 1/2



While this method is interesting to learn, most people have to re-generate it every time they want to use it.

Show both of these methods to your students, and give them time throughout the year to practice both.

ANSWER: 4, 7, 8

4 1002

This is the first logic problem students have met this year, for which the "organizing chart" wasn't given. In your small-group session, urge them to try a chart like:

	8	9	10	11
A				
J				
L				
H				

You might return to Worksheet I for this grade, and review the logic problem in terms of how to make some deductions by process of elimination.

ANSWER: Andy 10 Lee 8
Joe 9 Henry 11

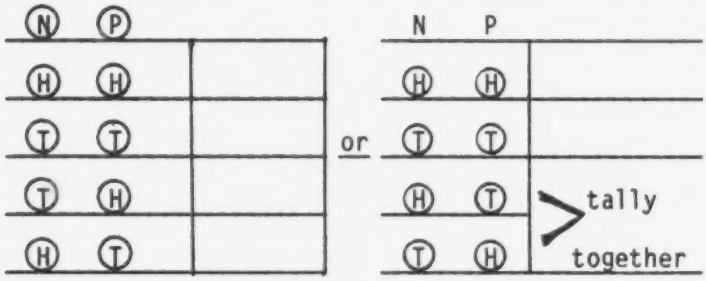
5 1110

In your small-group session, ask students which point they went to immediately from P. They will respond with either K, F, or L, since you can't do the puzzle if you go immediately to I.

ANSWER: Trace the student's path yourself to be sure it's correct. There are several different answers, some of which are:

P K E N M L J G I F P
-OR-
P F I G J L M N E K P
-OR-
P L M N E K I G J F P

6 1157 The problem is to design a simple probability experiment, collect data and draw appropriate conclusions. There are four possible outcomes which may be tallied in either of two ways:



In your small-group session, show them such a chart, and go through 10 tosses of the 2 coins together to show them how to record the data. They then re-do the experiment at home.

ANSWER: The design should include a tally chart similar to one of the above. The total number of tallies must be 40 and the results should be expressed as a fraction: $\frac{\text{number of H H}}{40}$ using their own data collected.

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1003 1010	In your small-group session, ask why these are called "triangle numbers?" Then ask a student to draw the next two figures that produce "triangle numbers." Mention to students that there is a pattern for finding the next triangle number in the sequence without drawing the figure--encourage them to look for this pattern, organize their work in a chart form, and guess the last number they are to find before they draw the figure.

Sample chart:

△ Number	Number
1st	3
2nd	6
3rd	10
4th	15
5th	21
.	.
.	.
.	.

Pattern: Start with 3, then add 3,4,5,6,7,etc., in order, to produce the triangle numbers.

ANSWER: 15, 21, 28, 36, 45

2	1001 1023	Ask for a student who solved this problem to tell the computational steps he or she used. Ask for a different approach.

Method 1: 1/4 of \$2.52 = \$.63
\$2.52 - \$0.63 = \$1.89

Method 2: 3/4 of \$2.52 = (1/4 of \$2.52) x 3
= \$0.63 x 3 = \$1.89

ANSWER: \$1.89

3	1034	The mixed numerals in this problem were purposely made difficult to work with so that the student will have to estimate to arrive at the answer. Point out that the word "about" is a signal to round off. In your small-group session, consider a similar problem in which you ignore a fraction like 1/983, but count as 1 a fraction like 73/74.

ANSWER: 30

4 1046 Review briefly with students the important consideration in comparing decimals--compare the larger place values first--once you can determine which is larger in the largest place value, you can ignore the rest.

ANSWER: a. = c. >
b. < d. <

5 1074 1077 Put "4410 ÷ x = 42" on the board, and translate it into a format more familiar to the students:

$$x\overline{)4410}\quad 42$$

Ask them how they can find x, and encourage them to say something like "It has to be true that x times 42 = 4410, so I can divide 4410 by 42 to find x." Suggest that they re-write each of the given equations in a more common (to them) format, and then reason logically about how to "reverse the situation involving x" to find out what number x has to represent.

ANSWER: (a) 105 (c) 429
(b) 1173 (d) 100

6 1108 Use tracing paper and show students how they can produce a "similar figure" by stretching or shrinking a given figure, but keeping the original proportions the same. Distinguish for them the difference in "is congruent to " and "is similar to."

ANSWER: a

7 -- Consider a similar problem in your small-group session, demonstrating how to regroup in this non-base ten system.

ANSWER: 2 days, 20 hours, 59 minutes

8 1168 Cover a similar problem in your small-group session--what number do you have to add to get the sum above 100? Let students find the answer on a calculator.

ANSWER: 55

9 1001
1006

Go through the procedure for finding the cost of A in your session. Encourage students to write an equation like:

A: cost = ($7.96 x 5) + ($3.98 x 2) + ($2.21 x 2)

and solve it using the memory unit on their calculator to store intermediate totals.

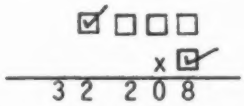
ANSWER: A. $52.18
B. $28.30 ($7.96 x 3) + ($2.21 x 2)
C. $71.64 ($3.98 x 14) + ($7.96 x 2)

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1001	Have a cardboard cut-out to represent a pizza, with lines drawn to divide it into sixths, as shown in the picture. Encourage a student who has already solved the problem to share his or her method, to the point of finding out how much each of the 6 pieces would cost by dividing 4 into $2.40. ANSWER: $1.80
2	1002	Remind the students that "making a chart" is usually a good way to start logic problems like this one. Start them off by drawing and labeling such a chart, and review briefly how you use /'s and x's with the clues . ANSWER: gymnastics, skating, fishing
3	1002 1009	Encourage students to list the days in April, May and June, and count to find the answer. Remind them that there may be some extra information (3 weeks) in such a problem. ANSWER: 63 days
4	1001 1022	In your small-group session, ask the students why these calculations would give the correct answer to the problem. Calls to Miami: $9(\$.27) + (43-9)(\$.18) = \square$ Calls to New York: $5(\$.28) + (35-5)(\$.20) = \triangle$ Total = $\square + \triangle$ Ask them how they could use the memory unit on a calculator to store these totals as they go. ANSWER: $15.95

5 1050
1004

Have a successful student share his or her approach to the problem. It will likely involve concentrating on these digits:



first, getting two whose product is 32. This will give them a modified "guess-check-revise" approach.

ANSWER: 4026
x 8
32208

6 1126

This problem extends problem 3 on worksheet XX and problems 4 & 5 on worksheet XIII. Cover some examples in class that are similar to the hardest one here (A).

Solution to A:

9 - 3 - [1/2] = 5 1/2

ANSWER: 5 1/2, 5 1/2, 2 1/2

7 1036

Encourage students to use a ruler marked off in mm for this problem, and to be precise.

ANSWER: A. 12 cm
B. 10 cm
C. 10 cm

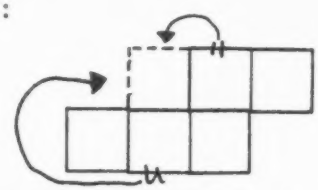
8,9 1075

Have some bundled sticks to represent each place value for base two, and go through a few practice problems in class similar to those on the worksheet. An interesting application of the base-two numeration system is covered as problem 6 of Worksheet XXVII. You might read that problem before the students encounter it, and set up a learning center activity based upon the application shown therein.

ANSWER: 8. (a) eleven (c) nine (e) four
(b) seven (d) three (f) thirteen

9. 111, 1011, 1111, 110

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1109	Point out to students what "equilateral" means--equal sides. Draw such a triangle, and tell them that their job is to find the correct word name for any of the angles. ANSWER: a. acute
2	1050 1002	Show students how 1 and 88, and 2 and 87, are 2 such pairs. Their problem is to find all such pairs, and count them. ANSWER: 44
3	1029	In your small-group session, discuss why an estimate is more appropriate than an exact calculation, for problems such as this. Have a student explain that you round 984 off to 1000, and then multiply by 24 (why?) and then by 7 (why?). Be sure to tell them that 984 x 24 x 7 will be counted as a <u>wrong</u> answer. ANSWER: d. 168,000
4	1006	Suggest that students having trouble with this problem make such a figure out of toothpicks or matches, and actually pick up pairs of sticks and place them in various spots, trying to make 4 squares. ANSWER: 
5	1005 1050	Encourage students to "work backwards" on this problem, by considering the multiplicative relationship between the divisor and quotient. Do a similar problem in class. ANSWER: 4684684684685

6	1124 1009	In class, have the students count to find the difference in 10°F and -10°F. Point out that the dates and places given is extraneous material (interesting, perhaps, but not vital to the problem). ANSWER: 263.3
7,8	1076	In your small-group session, have students consider the similar problem of odds and evens less than 20, and then 19. Hopefully they'll conclude that the sum of even numbers will always be even, but that the sum of odd numbers might be even or odd, depending on the number of addends. Suggest that, once they've conjectured an answer to this problem at home, that they use a calculator to verify their guess. ANSWER: 7. the even numbers less than 50. 8. both
9	1019 1001	Give the students the hint that if they can find out how much one pair of socks costs, they can find out how much 3 pairs cost. ANSWER: $2.03
10	1004	Students will probably solve this by "guess-check-revise." If so, they might guess the first number, add on the next 4, and see how close to 225 they are. They would then revise their guess up or down, accordingly. Suggest that they use a calculator to verify their guess. ANSWER: 43, 44, 45, 46, 47
11	1006	Suggest that students hold up to a mirror some clock faces from their math books, with numbers covered up, and see if they can guess the time. Once they've become familiar with this, they can try to answer this question (and check their guess by holding this clock up to the mirror, to "undo" the image reversal). ANSWER: 1:45

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1001	Have a student go through their procedure for solving this problem, without giving the numerical answer. ANSWER: $0.08
2	1009	Remind the students that real-world problems frequently have extra information in them, and a good problem solver has to concentrate on just exactly what he or she needs, ignoring the rest. ANSWER: 30 60 8
3	1125	In your small-group session, remind the students to measure carefully with a ruler, from the center of a star to the center of another. ANSWER: 800 miles
4	1053	Students have encountered "short division" on Worksheets XXIV and XXVI of Grade 4. This problem was purposely placed on the paper to encourage them to use "short division." Go over a couple of similar problems in class. With short division, you never write anything below the dividend--you have to do a lot of mental work, as in this stage of $7\overline{)52378}$: $7\overline{)52378}$ (7) Think: 7 x 7 = 49, and 49 from 52 = 3, so the next step is $7\overline{)33}$. Etc. ANSWER: 2357802357800235780000235780000 r. 4
5	1081	In your small-group session, show students how to find the LCM by looking only at multiples of the larger number, till you find one that's a multiple of the smaller number too. In class, check out the first 2 multiples of 64, to see if they're also multiples of 48. (They aren't, but 64 x 3 is.) Use a calculator. ANSWER: 192

6 1150

Ask a few questions similar to the given ones, to be sure students understand how to interpret the graph.

ANSWER: (a) 1968 (b) 1973 (c) 1970 (d) 146

7 1128

Give students a hint that the scale is not marked off in increments of 1 kg. They'll have to first determine what scale it is incremented in.

ANSWER: 14 kg

8 1020
1001

There are several ways of approaching this problem. The simplest, computationally, is probably to note that she makes a quarter more per week this year, times 52 weeks.

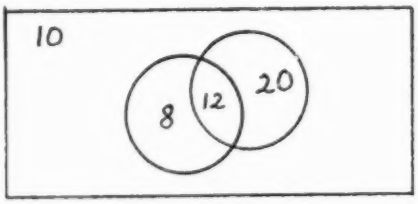
ANSWER: $13.00

9 1167

Go through this experiment in your small-group session. Actually take someone's pulse, write their pulse rate and age in the flowchart, and find the answer. (Be sure that they understand what each step in the flowchart does. After step 2, they'll know how many times per hour their heart beats, for example.) Students can re-do the experiment at home, for their stars.

ANSWER: This answer will vary. To check it for each student, use a calculator and multiply their heartbeat by their age, times 5256, and affix two zeros to the right end.

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1003	Change the numbers in this problem, and show students how to work from the inside-out with this circle diagram. That is, they first put in the number in the intersection of the regions, then the numbers in the circles but not in the intersection. Finally, they find the number outside the circles. In the given problem, the diagram would look like:  ANSWER: 10
2	1126	On the board, draw a big rectangle and label its sides 48x64. Then "take away" rectangles that are 15x36 and 38x13. Show them that the area of the house would be this same basic calculation. ANSWER: 2038
3	1006	Suggest that students organize their approach to this visual problem by moving a sheet of paper down the coins a little bit at the time, looking for differences. This allows them to concentrate their attention on one thing at a time. ANSWER: The 4th one from the left (no lines inside the ear).
4	1104 1006	Some students will have trouble with this problem since it requires a good ability to "see" 3-dimensional objects as 2-dimensional drawings. Point out that dotted lines show edges that are on the back of the figure, and can't be seen. Go over the first two in class, with paper models, and point out clearly how to count the faces. ANSWER: Clockwise from the one that's started, the answers are: Heptahedron, Octahedron, Tetrahedron, Dodecahedron, Hexahedron, Pentahedron

5 1074 1077 1004 1054

Go over a similar problem in class, showing students how to "guess-check-revise" until they find x. Point out that they'll learn in algebra how to solve such equations by logical deduction, rather than "guess-check-revise."

ANSWER: a. 10 b. 800

6 --

Point out to students that finding a common denominator is necessary before adding or subtracting fractions. In this case, the common denominator is obvious.

ANSWER: $\frac{28}{12}$ or $2\ \frac{4}{12}$ or $2\ \frac{1}{3}$

7 1002 1004

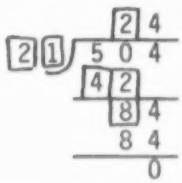
Suggest that students list the whole number pairs that add to 35, or enough of them to feel secure that they have found the pair with the largest product. Start such a list for them in class, as in:

Pairs that sum to 35	Product
35,0	0
34,1	34
33,2	66
.	.
.	.
.	.

They can finish it at home, to find the pair with the largest sum.

ANSWER: 18 and 17

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1002	In your small-group session, remind students to make a chart to solve such problems. Tell them to put the names along one dimension of the chart, and the occupations along the other. ANSWER: Druggist, grocer, butcher, policeman
2	1169 1009 1035	Remind students that percentages for test scores would always be between 0 and 100. So Mark was calculating the average of 5 numbers between 0 and 100. What's the most such an average could be? What's the least? ANSWER: He probably made a mistake. The average would have to be between 0 and 100.
3	1078	Have students substitute numbers for x one at a time, to see if they get a true statement, in an organized fashion. Start with 0, and work past 13. ANSWER: 0 through 11.
4	1050 1005	Have a student who has solved this problem report what they noticed first, that was a clue. Then have them describe how they proceeded "backwards" through the problem to find the other missing digits. ANSWER: 
5	1009	This newspaper clipping contains a lot of numbers that aren't useful in answering the questions. Have your small group of students tell the numbers that are not used. ANSWER: $31,000

6 1081

Do several similar problems in class. Do not force students to list all the factors of both numbers to begin--instead, have them start with the smaller number, and proceed backwards through its divisors (starting with the number itself) till they find one that divides the other number, too. This divisor will be the GCF.

For example, for GCF (30,24),

students start with 24.	Does it divide 30?	(No)
Then go to 12.	Does it divide 30?	(No)
Then go to 8.	Does it divide 30?	(No)
Then go to 6.	Does it divide 30?	(Yes)

So 6 is GCF (30,24).

Note: This method is much faster for the smaller numbers we use today in finding GCF of number pairs. A de-emphasis on computing with fractions has allowed us such luxuries.

ANSWERS:

4	15
5	30
6	10

7 1005
1004

Remind students that they can solve such problems easily by "working backwards"--the preferred method. To do so, they ask themselves what the number had to be at each previous step. (Another way is "guess-check-revise.") Be sure students note that step 2 is "+ 1," and not "x 1."

ANSWER: 13

8 1031
1035

Encourage students to think about this problem first, using a "benchmark height" for 1 meter, and make a good guess. They can then go measure such a car to verify or modify their guess.

ANSWER: 1.5 meters

9 1050

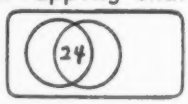
Do a similar problem in class, showing students that regrouping ("borrowing") for subtraction problems can be a challenge in a non-base ten system.

ANSWER: 1 week, 5 days, 18 hours, 51 minutes

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1079	Briefly review for students, with a few examples, the difference between prime and composite numbers. ANSWER: 2,3,5,7,11,13,17,19
2	--	Show students the truth of Goldbach's conjecture for a few even numbers not given in the list. 50, for example, is 19 + 31; 40 is 29 + 11; 60 is 31 + 29; etc. ANSWER: 4 = 2 + 2; 6 = 3 + 3; 8 = 3 + 5; 10 = 5 + 5; 12 = 5 + 7; 14 = 7 + 7; 16 = 5 + 11; 18 = 7 + 11; 20 = 7 + 13; 22 = 11 + 11 = 19 + 3; 24 = 11 + 13 = 19 + 5; 26 = 13 + 13 = 19 + 7; 28 = 11 + 17; 30 = 23 + 7 = 11 + 19; 32 = 19 + 13 = 29 + 3 NOTE: There are other ways of writing the even numbers above.
3	1002	Suggest that students "make a list" to solve this problem. They can list all the numbers from 1 gm. to 15 gm. (15 gm. being the largest weight obtainable from the 4 given.) They would then see if they could make each number on the list, crossing out those they can't make. The last step would be simply to count the numbers left uncrossed. Note: Although it doesn't appear to be, this problem is related to the base-two numeration system. Any whole number can be named using these place values, and their "extensions by doubling." ANSWER: 15
4	1006	Suggest that students organize their approach by finding and counting the smallest rectangles first, then move to the next largest, etc. ANSWER: 18

5 1003

Remind students that a circle diagram often helps when a problem describes sets with overlapping characteristics. They can sketch one like 

, and begin working from the inside-out.

ANSWER: 10

6 1075

Have paper, tape and a hole puncher ready for this activity. Students can use their pencils to make various letters of the alphabet as you call them out. Finally, get them to "code their first name" and give it to another student to check. Extend this activity in the week to follow as a "learning center" activity.

ANSWER: Decoding is easy and Numbers are fun.

7 1036

Suggest that students get their estimate by measuring the paper with a ruler, rounding off the numbers, and computing.

ANSWER: 90 square inches

TEACHER COMMENTARY

Problem	Skill of Excellence	Comment
1	1002	Remind students to make a chart to solve this problem. ANSWER: singer, writer, painter
2	1169	Go through this problem with the students, and how to do it efficiently on a calculator. They can start with .01 entered, and double it each day from Sept. 2nd through Sept. 30th. The first few days will yield: Sept. 1 .01 — Sept. 2 .02 — Sept. 3 .04 — Sept. 4 .08 — Sept. 5... .16 If they have a "repeating function" calculator, they can do this doubling by setting up the problem correctly (either by 2 x .01, or .01 x 2, depending on the calculator), and then just pushing [=] 29 times. ANSWER: Yes, the answer is logical.
3	1109 1110 1006	In your small-group session, use several concrete models of polyhedra (Kleenex box, etc.) for the students to count faces, vertices, and edges. After they have done that, show on the chalkboard how we represent such a figure in a drawing, with broken lines to show "hidden from view" edges. Go over the first figure in this problem, showing how to find the 7 faces, 15 edges, and 10 vertices. Students might be reminded that they found the faces of these polyhedra in problem 4 of Worksheet XXV. ANSWER: Top row: F = 7, E = 15, V = 10 — F = 8, E = 18, V = 12 — F = 4, E = 6, V = 4 Bottom row: F = 5, E = 9, V = 6 — F = 6, E = 12, V = 8 — F = 12, E = 27, V = 17

4 1010 1110

Point out to the students that Marsha made a conclusion, based on looking at concrete models of polyhedra, just as in problem 3 above. Marsha wasn't sure of her rule, because she would have to prove it for all polyhedra to be sure. They are asked to see if it holds true just for these given polyhedra. (It turns out this is a general formula--called Euler's Formula--that holds true about several topological concepts - (polyhedra, and networks in a plane, for example.)

Show them that (F+V)-E=2 is true for the first figure, since (7+10)-15 = 17-15 = 2.

ANSWER: Yes, it works for all of the given polyhedra.

5 1077

Take a couple of similar problems, showing students how they can either "guess-check-revise" to find x, or use the "inverse operation" notion.

ANSWER: a. 300 c. 35
b. 1176 d. 34

6 1147

Ask questions similar to the questions given in the problem, to be sure students understand the use of the "key" for such graphs.

ANSWER: a. 54°F (accept 53 or 55 also)
60°F (accept 59 also)
b. New York
c. New York

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